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RITSCHL (A.). **Untersuchungen über Gloeosporium fagicolum Passerini, den Erreger der Blattfleckenkrankheit der Buche.** [Studies on *Gloeosporium fagicolum* Passerini, the agent of the Beech leaf spot disease.]—*Z. PflKrankh.*, xlvii, 9, pp. 486–491, 5 figs., 1937.

For several years the writer has observed a beech disease occurring at elevations up to 1,000 m. in the Black Forest, chiefly in young stands, and associated with the presence of *Gloeosporium fagicolum*, first reported from Germany by H. Morstatt in 1909 (*Ann. mycol., Berl.*, vii, p. 45). In addition, however, to the irregular, brown, dark-edged lesions characteristic of that fungus, the foliage bore a number of spots along the veins strongly suggestive of those produced by *Gnomonia veneta* on *Platanus* [*R.A.M.*, xiv, p. 203]. The diseased areas frequently spread fanwise towards the leaf tips, being circumscribed laterally by two veins. The necrotic portions of the leaves subsequently fell out or were destroyed by wind or rain. The original centres of infection extended much more rapidly under wet than under dry conditions, and the entry of the fungus was apparently facilitated by the presence of the galls of *Hormomyia piligera*, in and around which stromata, 150 to 220 μ in diameter, were formed in profusion, giving rise in a humid atmosphere to whitish, later pink, tendrils or clusters of elongated, ovoid, biguttulate conidia, 9 to 15 by 4 to 6 μ, germinating in water in three to four hours at 22° C.

Conidia on beer wort agar at 20° to 22° produced white to pink colonies, becoming successively covered with a white stromatic network and a white, flocculent aerial mycelium and gradually developing marked zonations. Conidia were produced by budding from the mycelium and were of a more regular oval and squat shape than the original organs, uni- to biguttulate, with minimum and maximum dimensions of 8·5 by 4 and 10 by 5 μ, respectively. On beech chip decoction nutrient agar, conidia were sparsely formed, being replaced by a branched, radiating, stromatic mycelium from which arose after several months in the laboratory small pycnidium-like protuberances containing numerous regular, oval spores. No conidia developed on rice in test-tubes but brown to black sclerotia were formed, partially discolouring the medium.

Black, spherical pycnidia of the fungus, 185 to 220 μ in diameter, were first observed in nature on leaves collected in the forest on 26th November, 1934, protruding above the epidermis and containing numerous spores, 12·5 by 5 μ, which readily germinated in tap water,

producing a branched mycelium composed of densely interwoven, sheathed hyphae. Spherical perithecia, 125 to 230 by 160 to 250 μ, with beaks averaging 140 to 250 by 30 to 42 μ but attaining up to 600 μ in length, were detected on overwintered leaves in the open at the end of March; they were occupied by a large number of clavate asci, 49 to 56 by 8 to 13 μ, the upper parts of which were furnished with the circular pore characteristic of *Gnomonia*, containing eight elongated-oval, hyaline, uniseptate ascospores, 13 to 15 by 4 to 5 μ, closely resembling those of *G. veneta* and *G. quercina*. Pure cultures of ascospores on beer wort agar gave rise to a white aerial mycelium and slime drops consisting of the typical conidia of *Gloeosporium fagicolum*. Inoculation experiments with ascospores on beech seedlings in pots gave negative results.

It would appear from these researches that *G. fagicolum* represents the imperfect stage of a *Gnomonia* closely allied to *G. quercina*, *G. tiliae* [ibid., xv, p. 74], and *G. veneta* but differing from them in its considerably longer perithecial beak and asci without stalks resembling those of *G. alniella*. The name of *G. fagi* [without a Latin diagnosis] is proposed for the beech leaf spot organism, though it is perhaps scarcely more than a biologic race of the above-mentioned species.

Nisikado (Y.) & Yamauti (K.). **On Neocosmospora vasinfecta Smith, a causal fungus of seedling-wilt of Silk-tree, Albizzia julibrissin Durraz.**—*Ber. Ōhara Inst.*, vii, 4, pp. 549–556, 3 pl., 1937.

A serious wilt disease is stated to have developed recently among nursery seedlings of the silk tree (*Albizzia julibrissin*), which is largely used in the maritime districts of Japan for interplanting with black pines (*Pinus thunbergii*) to prevent the drifting of sand by the wind on to fields of cultivated crops. Infection appears during a dry spell in the middle of June in the form of a sudden wilt and defoliation, followed by the death of the seedlings. In 1935, 99 per cent. of the seedlings in some nurseries near Kanazawa were destroyed by the disease, only 2,000 to 3,000 out of some 200,000 surviving. Diseased roots turn brown and after a few days in a moist chamber become covered with white, later pale yellow to dark brown, guttulate, septate hyphae, 2 to 9 μ in diameter (commonly 4 to 6 μ), interspersed with globose or ovate perithecia, 150 to 340 μ in height (mean 240 μ), 120 to 270 μ in diameter (214 μ), with a coral- to vermilion-red peridium, 20 μ thick, and a neck 30 to 40 or up to 80 μ in length. The fungus was obtained in pure culture and identified, on the basis of comparative studies of the authors' isolations and material supplied by Prof. Johanna Westerdijk, Baarn, Holland, as *Neocosmospora vasinfecta* [*R.A.M.*, xv, p. 778], the distinguishing characters of both organisms being presented in tabular form. The asci of the silk tree strain measure 75 to 130 by 10 to 15 μ, the ascospores 10 to 18 by 7 to 13 μ, the mostly non-, frequently uni-, and rarely biseptate conidia 6 to 14 by 2 to 5, 11 to 36 by 3 to 5, and 21 to 37 by 3 to 5 μ, respectively, and the chlamydospores 5 to 12·5 by 5 to 12 μ (mostly 8·8 by 7·5 μ).

The pathogenicity of *N. vasinfecta* to watermelon, cotton, and other plants has been generally disputed since Butler's report on the parasitism of the fungus (*Mem. Dep. Agric. India*, Bot. Ser., ii, 9, 1910), but in the authors' tests the silk tree strain attacked its own host, watermelon,

and cotton under appropriate conditions [see next abstract], and can therefore no longer be regarded as a pure saprophyte.

NISIKADO (Y.) & YAMAUTI (K.). **Temperature relations to the vegetative and reproductive growth and the pathogenicity of Neocosmospora vasinfecta Smith.**—*Ber. Ōhara Inst.*, vii, 4, pp. 557–572, 1 pl., 1 graph, 1937.

The ascospores of *Neocosmospora vasinfecta*, the agent of seedling wilt of the silk tree (*Albizzia julibrissin*) in Japan [see preceding abstract], began to germinate in the writers' experiments under controlled conditions at 10° to 15° C., the optimum temperature for the process being about 30° and the maximum 38°. The minimum, optimum, and maximum temperatures for mycelial development were 10°, 30°, and 40°, respectively, for conidial growth 10°, 24° to 29°, and 38°, and for perithecial formation 10° to 15°, 27°, and 32° to 35°.

The pathogenicity of the fungus to silk tree, cotton (*Gossypium nanking*), and watermelon seeds and seedlings was demonstrated in seed and soil inoculation experiments at a temperature range of 10° to 35°, infection being more severe about 25° and comparatively slight below 15°. Germination was almost invariably entirely inhibited and the few plants surviving attack in the incipient stages of growth developed wilt later. The definitely non-saprophytic character of *N. vasinfecta* is considered to be amply proved by the results of these tests.

TAMBLYN (N.). **Decay in timber, with special reference to Jarrah.**—*Aust. For. J.*, ii, 1, pp. 6–13, 4 figs., 1937.

Following some general observations on the factors involved in the process of decay in timber, the writer describes some pathological conditions affecting jarrah (*Eucalyptus marginata*), an important commercial hardwood, in Western Australia.

Brown trunk rot (*Polyporus eucalyptorum*) [*R.A.M.*, vii, p. 406], probably the most destructive heart rot of the standing tree, frequently extends for 20 ft. or more through the bole. The decayed wood, in the later and more typical stage of the disease, is abnormally dark, compact but very brittle, and on drying out tends to crack cubically. The annular and radial shrinkage cracks are filled with relatively immense sheets of tough, white mycelium. The sporophores of the fungus often occur high up on the trunk (mostly of living trees) and are characterized by their large dimensions, thick, white, punky flesh, and conspicuous lemon-yellow colour of the pore surface (when fresh). Infection commonly takes place through dead or broken limbs and works downwards. In culture on 2 per cent. malt agar the fungus produces a thick, white, woolly growth, gradually turning greenish-yellow, and chlamydospores in profusion; clamp-connexions were not observed. The optimum temperature for growth in culture was found to be 25° C. *P. eucalyptorum* has also been recorded on various *E.* spp. in New South Wales, Victoria, and South Australia.

Xylostroma heart rot (*P. tumulosus* var. *westraliensis*) has frequently been found vigorously disintegrating old, fallen jarrah logs but was only once isolated from the living tree. The sporophores of the fungus, usually occurring in summer on recently burnt soil, arise from a pseudo-

sclerotium of mycelium-impregnated soil formed in the ground below the log during the process of decay. They are generally solitary, with a short, thick central stipe, a pale tan upper surface, white, punky flesh, and a cream or discoloured pore surface; the caps may measure up to 7 in. in diameter. On 2 per cent. malt agar *P. tumulosus* var. *westraliensis* forms a profuse, white mycelium, numerous clamp-connexions, and a few chlamydospores. Rapid growth is made at the optimum temperatures (about 30° and 25° during the first and second weeks, respectively). Typical decay was induced in moist, sterilized jarrah blocks inoculated with a pure culture of the organism.

Yellow straw butt and trunk rot of mature and over-mature stands of *E. marginata*, *E. staeri* Maiden, *E. jacksoni* Maiden, and (probably) *E. guilfoylei* Maiden, is characterized in the incipient phase by small, bleached, irregular patches of infection, giving the wood a yellow mottled or streaked appearance. As decay advances the rotted areas assume a deep straw colour and stringy consistency. In culture on 2 per cent. malt agar a buff to pinkish-buff aerial mat is formed and fertile pore surfaces of somewhat daedaloid type are often produced after the second week. The globose, hyaline basidiospores average 5·1 by 4·0 μ. Large, simple clamp-connexions develop abundantly, but neither fruit bodies nor chlamydospores have been detected. The optimum temperature for growth in culture was found to be about 30°. Viability was retained for 12 months under dry laboratory conditions.

Black straw rot, though of a much darker colour, is commonly confused with the foregoing on casual inspection, but microscopic examination reveals the presence of an exceptional phenomenon in the form of numerous large bore holes running for long distances down the secondary fibre walls parallel to the long axes of the fibres. A Basidiomycete, constantly associated with this rot, has been isolated but not yet identified. Viability was retained for 12 months in culture.

A white pocket rot, due to a fungus tentatively identified as *Fomes lineato-scaber*, is prevalent as a butt rot of young jarrah coppice growth and also occurs in old logs, stumps, and dead roots. It is characterized by numerous small, irregular, white pockets and streaks of decay, lined with white, delignified fibres and separated by thin areas of apparently sound wood. In older rotted areas the white fibres may disappear from the pockets, which become partly filled with brown mycelium.

A common abnormality of *E. marginata* is 'included sap', which also affects karri (*E. diversicolor*) [ibid., xvi, p. 506], almost invariably in association with the galleries of *Xyleborus truncatus*. In both hosts fungal mycelium has regularly been found in the 'included sapwood' areas, and in the latter species this element is apparently responsible for the non-maturation of the affected wood. On account of the porous nature of 'included sapwood', timber with this defect is unsuitable for pipes or 'tight' cooperage, nor can it be expected to possess the durability in service of normal true wood.

'Pencilled wood', affecting *E. marginata*, *E. jacksoni*, and *E. guilfoylei*, is also of fungal origin, the causal organism being apparently identical with *Fistulina hepatica* [ibid., xvi, p. 4], the sporophores of which are common on jarrah trunks in Western Australia and have also been reported from New South Wales, Victoria, and South Australia.

The appearance of 'pencilled' jarrah differs according to the plane of surface: on a transverse face numerous dark streaks about 1 mm. in thickness occur, radiating outwards for 2 in. or more. Viewed tangentially, the pencilling appears as dark, elongate pockets or streaks running parallel to the direction of the fibres and imparting a speckled aspect to the wood. On a radial longitudinal face the discolorations appear as irregular, dark smudges. The dark coloration is attributable to excessive infiltration of the fibre and vessel lumina with an abnormally heavy, dark deposit of kino [the dark reddish-brown gum of various tropical trees]. *F. hepatica* appears gradually to lose its viability after felling and positive isolations were not made from timber stored for longer than a year. On the other hand, it seems to remain active in the true wood of living trees for many years; isolation presents some difficulty and is best effected from diseased sapwood or newly formed true wood.

Ludbrook (W. V.). **Needle fusion of species of Pinus in southern New South Wales. Progress report 1933–36.**—*Pamphl. Coun. sci. industr. Res. Aust.* 72, 23 pp., 3 pl., 1937.

In this paper the writer summarizes the information accumulated in the course of investigations from 1933 to 1936 on the 'needle fusion', 'fused needle', or 'curly needle' disease of pines, which is stated to be confined to Australasia and of importance chiefly in Queensland, Tasmania, and the coastal plantations of New South Wales [*R.A.M.*, xiii, p. 553; xvi, p. 234]. In southern New South Wales the needle abnormalities associated with the disturbance commonly appear from three to seven years after the trees have been planted in their permanent positions. In addition to the apparently immune *Pinus pinaster*, *P. caribea* has shown some measure of resistance to needle fusion. Diseased needles were found to be markedly deficient in starch compared with healthy ones. With the doubtful exception of boron none of the soil treatments applied against needle fusion proved effective. The maximum incidence of attack so far recorded in trial plots is 33·3 per cent.

Fracker (S. B.). **Progress in the control of White Pine blister rust.**—*Science*, N.S., lxxxvi, 2229, pp. 266–267, 1937.

In this account of the control of white pine (*Pinus strobus*) blister rust [*Cronartium ribicola*: *R.A.M.*, xvi, p. 287] in the United States the author states that the protection of valuable stands of five-leafed pines has progressed rapidly, especially since 1933, and excellent advances have been made in the protection of *P. strobus*, *P. monticola*, and *P. lambertiana*, the three commercially valuable species of susceptible pines which cover an area of about 15,000,000 acres of land. The 900 ft. border zones required to be kept free from *Ribes* spp. increase the acreage of control areas to over 26,000,000 acres and of these over 18,000,000 acres had been given one working for the eradication of *Ribes* by the end of 1936. There is some regeneration of *Ribes* after eradication, and parts of the control areas have to be worked over again in from about three to ten years, but working over the area one to three times seems to afford adequate protection to the pines from the seedling stage to maturity.

ACREE (RUBY J.) & GOSS (W. H.). **A microchemical colorimetric P_H procedure for differentiating the telia of Cronartium ribicola and C. occidentale.**—*J. agric. Res.*, lv, 5, pp. 347–352, 1937.

A description is given of a technique by means of which the authors claim to have demonstrated the presence in the teleuto stages of *Cronartium ribicola* [see preceding abstract] and *C. occidentale* [*R.A.M.*, xiv, p. 377] of a minute physico-chemical difference, which is intensified by treatment with dilute acid, distilled water, and bromphenol blue under P_H control, when *C. ribicola* stains blue and *C. occidentale* green. The definition and consistency of the results obtained is considered to indicate the possibility of rapidly differentiating the two rusts in the teleuto stage even when only small and sparsely infected specimens are available.

YOUNG (H. E.). **The prevention of blue stain in Hoop Pine logs.**—*J. Aust. Inst. agric. Sci.*, iii, 3, pp. 160–162, 1937.

In an experiment carried out in Queensland in which hoop pine (*Araucaria cunninghamii*) logs were sprayed (by means of a knapsack sprayer) with various chemicals (after barking) against blue stain, caused principally by *Diplodia pinea* [*R.A.M.*, xvi, pp. 148, 787] the best control was given by lignasan (ethyl mercury chloride) [ibid., xvi, p. 428] both in the rain-forest and at the loading ramps in the open. No blue stain developed on the lignasan-treated logs for seven weeks, though the condition was clearly apparent in the untreated logs within four weeks of felling. Bordeaux mixture came next in efficiency, followed in order by creosote soap emulsion and 'quartzite' (meta sodium silicate), of which the last gave practically no control. Unbarked logs, the ends of which were sealed with creosote-vaseline paint, remained clean, but became difficult to bark after a few days; this method should, however, ensure the preservation of logs that have to be kept in the forest for some time.

Blue stain developed more rapidly outside the rain-forest than within the timbered area owing doubtless to warmer temperatures and quicker drying. Logs placed on skids in the open were more severely stained than those left on the ground and the upper side of the latter showed more staining than the lower. Some trees showed individual resistance. The sprays, to be effective, had to be applied within 24 hours of felling and barking, and as lignasan did not check borer damage, which causes as much deterioration as staining, the logs must be removed from the stump to the mill with all possible speed. During the eight weeks of the experiment only the sapwood was affected by the staining fungi.

DOWNEY (E. J.). **Open tank creosote treatment of Shortleaf and Loblolly Pine poles.**—*J. For.*, xxxv, 4, pp. 349–352, 2 figs., 1937.

To meet the demands for small telephone poles required by the Texas Forest Service an enlarged open-tank creosoting plant was erected consisting of two rectangular tanks, 3 by 3 by 18 ft., with a space under each for firing and an overhead system of blocks for the manipulation of an entire charge of poles as a unit. For the treatment of the first six charges of shortleaf and loblolly pines (*Pinus echinata* and *P. taeda*, respectively), the hot vat was kept at about 190° F., while the cold one

was allowed to remain at air temperature (average 90°). After two hours in the hot vat the charge was rapidly transferred to the cold one and left submerged for two hours at 90° to 100°. This treatment gave excellent penetration of creosote, averaging 2 in. at 2 ft. from the butt end of the pole, but the amount used (18 to 20 lb. per cu. ft.) was regarded as excessive for the type of material employed and extensive loss of creosote occurred through 'bleeding' [*R.A.M.*, xvi, p. 79]. By treating the poles for one hour in the hot vat at 220° to 225°, then transferring them to the cold one at about 100° for 1 to 1½ hours, and subsequently returning them to the hot vat for 30 minutes at 225° [cf. ibid., xvi, p. 429] the retention of creosote was reduced to 12·8 lb. per cu. ft., and 'bleeding' was entirely prevented, while the average penetration obtained was 1·83 in.

Desch (H. E.). **Sapwood versus heartwood.**—*Builder, Lond.*, clii, 4915, p. 842, 1937.

Referring to the discrimination against the use of sapwood which is stated to be a common feature of timber specifications in building contracts, the writer points out that sapwood presents no attractions to the agents of decay when sufficiently seasoned, i.e., to a state in which it contains less than 25 (or to be absolutely safe, 20) per cent. of its dry weight of water. Properly seasoned joinery in a well-ventilated building should contain 10 to 15 per cent. moisture, basement and ground-floor joists and roofing timbers 18 to 22 per cent. In this connexion it may be mentioned that the common clause insisting on a bright, clear condition of such sapwood as is permitted is superfluous, since the dullness due to blue stain [*Ceratostomella* or *Ophiostoma* spp. and other fungi, see next abstract] does not involve any reduction of strength.

Greaves (C.). **Chemicals in wood preservation.**—*Canad. Chem. Metall.*, xxi, 9, pp. 301–304, 1937.

This is a useful survey of some outstanding recent investigations [reference to which has been made at intervals in this *Review*] on various aspects of wood preservation, including the nature of the substances used for this purpose, the mechanism of injection, methods of testing the permanence and toxicity of preservatives, the variable character of creosotes, creosote specifications [*R.A.M.*, xvi, p. 788], high and low residue creosotes, and modern developments in wood preservation.

Howitt (J. E.), Sands (D. R.), & Beck (E. C.). **Diseases of vegetables.**—*Bull. Ont. agric. Coll.* 386, 70 pp., 33 figs., 1937.

Popular descriptions are given of the symptoms of a number of well-known fungous, bacterial, and virus diseases affecting vegetables in Ontario, with observations on their etiology and directions for control.

Tompkins (C. M.), Gardner (M. W.), & Thomas (H. R.). **Black ring, a virosis of Cabbage and other crucifers.**—Abs. in *Phytopathology*, xxvii, 9, pp. 955–956, 1937.

Black ring, a virus disease of cabbage, occurs during the cool weather in the San Francisco Bay region and elsewhere in California. In the

early stages the numerous chlorotic rings formed on the leaves collectively induce chlorosis, followed by blackening and necrosis of the affected tissues. In the field only older leaves show black ring symptoms, which are most conspicuous on the dorsal surface, but in the greenhouse systemic infection of healthy seedlings was obtained in 9 to 21 days by rubbing the foliage with expressed juice and carborundum. The insect vectors, which breed naturally on the host, are the cabbage and green peach aphids [*Brevicoryne brassicae* and *Myzus persicae*, respectively]. The virus succumbs to ten minutes' heating at 59° C., three days' ageing at 22°, and diluting 1 to 1,000. All commercial varieties of cabbage appear to be susceptible, and infection was further obtained on rhubarb, *Chenopodium album*, *C. murale*, spinach, *Stellaria media*, *Brassica arvensis*, kale, Brussels sprouts, cauliflower, broccoli, kohlrabi, swede, turnip, wallflower, Brompton and annual stocks [*Matthiola incana* and its var. *annua*, respectively], dame's violet [*Hesperis matronalis*], Virginian stock [*Malcomia maritima*], watercress, honesty [*Lunaria annua*], Chinese radish, Turkish and White Burley tobacco, and *Nicotiana glutinosa*. The disease is similar to the cabbage ring spot described by K. M. Smith in England in 1935 [*R.A.M.*, xv, p. 97].

Woodcock (J. W.) & Merry (D. M.). **Control of brown-heart in Swedes.**—*N.Z. J. Agric.*, lv, 3, pp. 151–154, 1937.

In 35 field trials carried out in New Zealand to ascertain the effect of borax on the control of brown heart of swedes [*R.A.M.*, xvi, p. 722], the borax was mixed and drilled along with the fertilizer and seed, at rates of 3, 6, 9, and 12 lb. per acre, or broadcast before or immediately after drilling, a few broadcast applications being made, in addition to the dressings given at seeding, at thinning, and when the crop was half-grown.

Mixing the borax with fertilizer and sowing in intimate contact with the seed in some cases adversely affected the seedlings, even at the lowest rate of application, though broadcasting at 10 lb. per acre before sowing was not injurious. Satisfactory control was obtained in all but six tests. When the borax was drilled, applications of 3 lb. or more per acre gave a high degree of control (70 per cent. or more reduction in incidence) in seven tests, while in three the lowest amount required to effect this reduction was 6 lb., and in seven 9 to 12 lb. per acre. In one experiment, in which applications of 3 and 6 lb. per acre were only slightly effective, an application of 10 lb. of borax broadcast before sowing was as satisfactory as 9 and 12 lb. applied in close proximity to the seed. Broadcasting at thinning appeared to be as effective as broadcasting before seeding, but when applied about half-way through the growing period borax was generally less effective. The addition of lime to borated mixtures had no effect on control.

It is recommended that the borax should be broadcast (with sawdust or soil to facilitate distribution) before or shortly after sowing at rates ranging from 10 to 20 lb. per acre. If top-dressing is impracticable drilling at 3 to 6 lb. per acre is likely to give fair control without too much injury, which is further reduced by sowing the crop in 7 in. drills or putting one half of the borated fertilizer below and one half with the seed.

Le Clerg (E. L.). **Relative efficiency of randomized-block and split-plot designs of experiments concerned with damping-off data for Sugar Beets.**—*Phytopathology*, xxvii, 9, pp. 942–945, 1 diag., 1937.

In the split-plot type of experimental design proposed by Yates (*J. agric. Sci.*, xxiii, p. 108, 1933; *J.R. statist. Soc., Suppl.* 2, p. 181, 1935), one half of each plot receives a different treatment from the other half, this difference being superimposed on the main treatment. In this paper the writer describes experiments in Minnesota to determine the relative efficacy of this arrangement and that of randomized blocks for the collection of statistical data in field and greenhouse tests on sugar beet damping-off [*Corticium solani*, *Phoma betae*, and *Pythium de Baryanum*: *R.A.M.*, xiii, p. 611; and next abstract]. In 1936 the split-plot design was 71 per cent. more efficient in the field at St. Paul and 53 per cent. more at Waseca than the randomized-block arrangement. In greenhouse tests in 1933 the variance for the former method on a concrete bed and broad-wall bench, respectively, was 146·14 and 194·61 compared with 153·46 and 211·33, respectively, for the latter. Soil-borne pathogens were also shown by these experiments to be unequally distributed in the field.

Le Clerg (E. L.). **Treatment of Sugar-Beet seed increases stand and yield.**—*Circ. Minn. Coll. Agric. Ext.* 57, 7 pp., 2 figs., 1937.

Damping-off of sugar beet seedlings, a destructive disease in early plantings on moist soils in Minnesota [see preceding abstract], is caused by a number of fungi which are most active in stands immediately following lucerne or sweet clover [*Melilotus alba*] and usually less in evidence after maize. In a series of tests from 1933–5 on the control of the disease by seed treatment, the average number of seedlings before thinning in 100 ft. of row was 1,119 in the ceresan-treated plots compared with 653 in the non-disinfected controls. In 1935, 20 growers were each sent a 25 lb. lot of treated seed to be planted under identical conditions with untreated material of the same variety. In four fields in which counts were made before thinning the average increase in stand due to seed treatment was 29·2 per cent. In three fields in 1936 the average increase from treatment amounted to 86·4 per cent. before thinning and 31·3 per cent. at harvest, while the yield of the treated plants was increased on the average by 1·6 tons per acre or 17 per cent. [This article is reprinted in *Agric. News Lett.*, v, 11, pp. 192–195, 1937.]

Lackey (C. F.). **Restoration of virulence of attenuated curly top virus by passage through susceptible plants.**—*J. agric. Res.*, lv, 6, pp. 453–460, 3 figs., 3 graphs, 1937.

Details are given of two years' experiments, the results of which showed that the virulence of the beet curly top virus [*R.A.M.*, xvii, p. 90] attenuated by passage through *Chenopodium murale* [ibid., xi, p. 688] may occasionally be restored to approximately the same potency as that of the original virus by one passage through sugar beet seedlings at the cotyledonary stage; in two cases only it was also restored by passage through seedlings at the two-leaf stage, but never through older plants. There was some evidence of individual variations in the susceptibility of the sugar beet plants tested to inoculations with

either the original virulent or the restored curly top virus, as manifested by the appearance of mild symptoms in a few of the plants inoculated. Passage through alfilaria (*Erodium cicutarium*) and peppergrass (*Lepidium nitidum*), two important wild overwintering hosts for both the curly top virus and its insect vector (*Eutettix tenellus*), was experimentally shown also to be occasionally capable of restoring the virulence of the attenuated virus.

Tsui (P. T.) & Lin (C.). **Experiments on the effect of spraying fungicide to control Broad Bean rust.**—*Ent. & Phytopath., Hangchow,* v, 24–25, pp. 491–495, 1937. [Chinese, with English summary.]

Satisfactory control of broad bean rust (*Uromyces fabae*) [*R.A.M.*, xvi, p. 207], one of the most serious diseases in the Hangchow district of China from the middle of March to the first week of May, has been obtained by weekly applications, from before flowering to harvest, of 0·6 per cent. Bordeaux mixture.

McWhorter (F. P.) & Pryor (J.). **Onion mildew in Oregon and the advisability of testing malachite green as a control agent for downy mildews.**—*Plant Dis. Reptr,* xxi, 16, pp. 306–307, 1937. [Mimeographed.]

Tests on the control of onion mildew (*Peronospora destructor*) [*P. schleideniana*] in the Willamette Valley, Oregon, where the crop is grown on a commercial scale for seed, gave very promising results in respect of combinations of malachite green [*R.A.M.*, xvi, pp. 14, 468] and bentonite [ibid., xvi, pp. 190, 477, 765] or red copper oxide [ibid., xvi, pp. 659, 720]. Malachite green has also been found to be very toxic to *P. pisi* [ibid., xvi, p. 298]. The dye is effective at very high dilutions but on account of its cheapness may be used at concentrations of 1 in 5,000 or less. Further trials on the efficacy of the dye against other downy mildews are advocated.

Wiant (J. S.). **Investigations of the market diseases of Cantaloups and Honey Dew and Honey Ball Melons.**—*Tech. Bull. U.S. Dep. Agric.* 573, 47 pp., 21 pl., 16 graphs, 1937.

Studies [which are fully described] on diseases of melons arriving at New York market, carried out from August, 1931, to the end of 1935, showed that *Fusarium* rot attacks cantaloupes and Honey Dew and Honey Ball melons, and is one of the chief causes (as stem-end rot) of decay in South American Honey Dew melons. The following species were isolated from diseased material: *F. graminum*, *F. semitectum* and its var. *majus*, *F. equiseti* and its var. *bullatum*, *F. scirpi* and its vars. *acuminatum* and *compactum*, a fungus designated *F.* 197–2, *F. culmorum*, *F. moniliforme* [*Gibberella fujikuroi*] var. *subglutinans*, and *F. solani*. Of the 34 isolates, 21 fell within the limits of *F. semitectum* and *F. scirpi*. The symptoms produced by the different species are almost identical, except that *F. graminum*, *F. scirpi* var. *acuminatum*, *F. culmorum*, and *G. fujikuroi* var. *subglutinans* give a reddish or purplish discoloration. On cantaloupes the remaining fungi produce lesions scattered over the surface, on the stem scar, along the sides, or at the blossom end. At first the lesion is almost imperceptible. The infected tissue usually

extends from ¼ to ¾ in. beneath the rind and is sharply delimited from the healthy part. *F. semitectum* and its var. *majus*, *F. equiseti* and its var. *bullatum*, *F. scirpi* and its var. *compactum*, *F.* 197–2, and *G. fujikuroi* var. *subglutinans* made optimum growth at 80° F., very little or none at 95° in five days, and none at 37° in the same period, though all except *F. scirpi* var. *compactum* and *F. equiseti* showed a trace of growth at 37° in three weeks. *F. culmorum* made the most rapid growth [*R.A.M.*, xvi, p. 806]; its optimum growth temperature was 75°, and it made some growth at 37° in 11 days. *F. scirpi* var. *acuminatum* and *F. graminum* showed optimum growth at 75°, with definite growth at 95° in five days, growth declining at temperatures progressively below 70° until at 37° *F. graminum* showed only a trace of growth and *F. scirpi* var. *acuminatum* none in five days. *F. solani* made optimum growth at 85°, no growth occurring in five days at 105°. Artificial inoculations of Honey Dew and cantaloupe melons with *F. semitectum*, *F. scirpi* and its vars. *compactum* and *acuminatum*, and *F.* 197–2 gave about equal rates of decay, the average diameter of the lesions after one week at 65°, two weeks at 55°, and three weeks at 45° not exceeding 16, 17, and 10 mm. respectively. Only *F. scirpi* var. *acuminatum* gave a trace of decay at 35° after two weeks. Rupture of the skin was essential for infection. The stem-end rot may prove controllable by fungicidal applications to the cut stems.

Rhizopus soft rot was found on cantaloupe and Honey Ball and Honey Dew melons, the first symptom on the last two being a water-soaked, soft, well-defined spot, the advancing margins of which generally remained distinct. On cantaloupes the water-soaking was less evident. No mould grew on unbroken skin. When pressed with the fingers the disease area was wet and felty. Of 37 isolates 16 belonged to the low-temperature group of *Rhizopus* (including *R. nigricans*) [ibid., ii, p. 564] and 14 of these had an optimum growth temperature of 80°. Twenty-one isolates belonged to the intermediate temperature group and had an optimum growth temperature of 90° or 95°. None of the fungi was able to penetrate unbroken skin. Decay by the low temperature group developed best at 80°, and none occurred in three days at or below 50°, or at or above 95°. The optimum temperature for decay by the intermediate temperature group was 90°, the rate falling off rapidly above 100°, none occurring in 3 days at 110° or at 50°. Transit temperatures of 40° to 45° are recommended.

Alternaria rot appears on Honey Ball and Honey Dew melons as small, circular to oval, brownish spots, with regular, definite edges enlarging up to 2½ in. in diameter, sometimes coalescing, and occasionally occurring on the sides. Decay is often largely confined to the rind, which may be dry and papery, or tough and parchment-like. In 21 representative isolates, all of which fell into the *A. tenuis* or *A. brassicae microspora* (Berk.) Sacc. groups of Elliott [*Amer. J. Bot.*, iv, pp. 439–476, 1917] the spores ranged from 10 by 8 to 60 by 22 (average 25·4 by 11·9) μ. The optimum growth temperature of 5 representative isolates lay between 75° and 80°; decay fell off below 70° and ceased at 37°. Transit temperatures of 40° to 45° are recommended.

Cladosporium rot (*C. cucumerinum*) [ibid., viii, p. 626; xi, p. 690; xvi, p. 655] frequently covers the stem scar of cantaloupes arriving at

New York from western States. In the early stages the deep olive growth is superficial but later it turns almost black and causes a shallow decay of the tissues. Honey Ball and Honey Dew melons are also affected. Observations in storage rooms indicated that rotting occurred after one week at 40° to 42° and after ten weeks at 32° to 34°. Control depends on prompt handling and maintenance at temperatures under 40°. Under unfavourable temperature conditions infection is favoured by the use of wrappers.

Phytophthora rot of Honey Dew melons [cf. ibid., viii, p. 353 and cf. next abstract] is ordinarily of minor importance but under certain conditions it may cause almost the entire loss of the carload. At low temperatures the rot appears as circular to oval spots 1 to 4 in. in diameter, and sometimes coalescing, over which the skin may be slightly depressed to sunken. On pale melons the lesions scarcely change colour, while on darker ones they become cartridge-buff, cream, or cream-buff. Later, the lesions are extensive, indefinite, and irregular. The diseased tissues become spongy or leathery, creased, and wrinkled; the epidermis becomes loose, blisters, and is easily rubbed or peeled off. Inoculations of Honey Dew melons with a number of isolates differing in cultural and morphological characters gave identical symptoms, but the specific identity of the causal organism or organisms remains undetermined. With one isolate the optimum temperature for decay was 80°; of the others, half made best growth at 80° and half at 85°. Prevention consists in keeping the melons at 50° or under.

Charcoal rot (*Rhizoctonia bataticola*) (one isolate of which formed pycnidia similar to those of *Macrophomina phaseoli*) [see above, p. 115] causes 1 to 5 per cent. loss in every cargo of Honey Dew melons reaching New York from Chile. The first symptom is a faint, dark water-soaking of the skin. After 5 days at 85° the lesions are about 3 in. in diameter, firm, irregular, indefinite, and often spreading more rapidly equatorially than towards the stem and blossom ends. The lesions are vinaceous-drab, slate-purple, or light vinaceous-purple, the colour varying with different melons and with the progress of the decay; different colours may also be present in the same lesion. The centre of the lesion turns light mouse-grey and is covered with greyish mycelium. The epidermis becomes encrusted with black sclerotia, the skin wrinkles, and the affected areas become less firm and generally depressed. Beyond this area extends a wide band of diseased, firm, smooth, mouse-grey tissue in which the skin becomes water-soaked under pressure and can readily be slipped off. The whole melon becomes affected. The fungus was unable to penetrate the unbroken skin of Honey Dew melons and infection could be almost eliminated by careful handling and transit at under 50°.

Diplodia natalensis rot occurs regularly on Chilian Honey Dew melons. The disease, which is of minor importance, requires skin breaks of some kind for entry of the fungus and would be practically eliminated by transit at under 50°.

Pink mould (*Cephalothecium* [*Trichothecium*] *roseum*) [ibid., ix, p. 531] is important only on South American Honey Dew melons. In cantaloupes the chief diagnostic character is a pronounced bitter flavour. On Honey Dew melons extensive lesions may develop on the

sides or stem end, or small, more definite, lesions may form on the sides. The affected rind is clay-colour, tawny-olive, ochraceous-tawny or buckthorn- to Dresden-brown. The diseased flesh is slightly discoloured brown, not sharply delimited, and is extremely bitter. Transit at temperatures under 40° should control the condition.

The paper concludes with notes on bacterial soft rot [organisms unidentified], *Colletotrichum lagenarium* [ibid., xvi, p. 793], blue mould (*Penicillium* spp.), and minor decays caused by *Mucor* sp., *Aspergillus* sp., *Botrytis cinerea*, and *Monilia sitophila*.

KREUTZER (W. A.). **A Phytophthora rot of Cucumber fruit.**—Abs. in *Phytopathology*, xxvii, 9, p. 955, 1937.

A species of *Phytophthora* was collected in the autumn of 1936 from rotting cucumber fruits in a field in the Rocky Ford district [of Colorado], where 100 per cent. infection occurred. After 6 months in culture the fungus had formed no reproductive bodies but a close relationship to *P. capsici* [*R.A.M.*, xvi, pp. 159, 793, and cf. preceding abstract] is indicated. In inoculation tests it was pathogenic to cucumber, Hubbard squash, and red and green bell pepper [*Capsicum annuum* or *C. frutescens*] fruits, and caused severe damping-off of cucumber and pepper seedlings. Ten to twenty days after the introduction of the fungus into soil in which mature peppers were growing, the plants developed a severe blight.

JAGGER (I. C.) & SCOTT (G. W.). **Development of powdery mildew resistant Cantaloup No. 45.**—*Circ. U.S. Dep. Agric.* 441, 5 pp., 4 figs., 1937.

An account is given of the breeding, characteristics, adaptation, and dissemination of the strain of cantaloupe melon (*Cucumis melo*) known as No. 45 which has been developed in California for resistance to powdery mildew (*Erysiphe cichoracearum*) [*R.A.M.*, xvii, p. 125]. The strain originated from a resistant plant in a variety from India crossed with Hale Best in 1928 and resistance was inherited as a simple Mendelian dominant factor. It is stated that this melon is generally completely free from the disease in the Imperial Valley, while in the coastal regions of California, where conditions are very favourable to infection, it usually shows some mildew late in the season, but not enough to cause appreciable injury to the crop.

CRISTINZIO (M.). **Un grave attacco di mosaico nella Zucca.** [A serious attack of Vegetable Marrow mosaic.]—*Ric. Ossvz. Divulg. fitopat. Campania ed Mezzogiorno* (*Portici*), vi, pp. 95–102, 2 pl., 1937.

In April, 1937, vegetable marrows in the vicinity of Naples were extensively attacked by mosaic [*R.A.M.*, xiv, p. 489], some fields showing up to 90 per cent. infection. *Aphis gossypii* was present in abundance, particularly on the affected plants, which showed characteristic symptoms on the young fruits and leaves [loc. cit.] and, occasionally, on the leaf stalks and male flowers. Control consists in the use of resistant varieties, the destruction of infected plants, seed disinfection, and insecticidal treatments.

CLARA (F. M.). **Culture of edible Mushrooms in the Philippines.**—*Philipp. J. Agric.*, viii, 2, pp. 225–231, 4 pl., 1937.

Directions are given for the cultivation of edible mushrooms of the *Volvaria esculenta* [*R.A.M.*, xv, p. 422] type under the conditions prevailing in the Philippine Islands. It is pointed out that abacá [*Musa textilis*] fibre refuse, banana stalks, tobacco midribs, old gunny sacks, and abacá mat trimmings may be used as layers for spawning or mixed with rice straw for making the beds.

TROTTER (A.). **I trattamenti polverulenti contro la Peronospora della Vite.** [Dust treatments against Vine mildew.]—*Ric. Ossvz. Divulg. fitopat. Campania ed Mezzogiorno* (*Portici*), vi, pp. 108–110, 2 pl., 1937.

The author points out that many Italian growers place too much reliance on the number of spray applications made against vine mildew [*Plasmopara viticola*] and fail to realize that dusting is an indispensable part of any control schedule, especially against infection of the fruit clusters under the climatic conditions prevailing in south Italy, where the disease is liable entirely to destroy the bunches. Fluids cannot adequately reach or adhere to the berries and, in particular, they fail to pass between the berries and between the flowers, with the result that they do not reach the most common path of infection. Fine ventilated sulphur or cupric sulphur, if of the best quality and properly applied, covers the whole plant uniformly, penetrating rapidly into the innermost parts of the fruit clusters, and is therefore not likely to be washed off by rain. Three dust applications (in addition to the usual sprays) are essential, i.e., before flowering, after flowering, and when necessary to protect the leaves against late infections. These applications also protect the vines against *Oidium* [*Uncinula necator*].

JENNY (J.). **Eine moderne stationäre Spritzanlage mit elektr. Antrieb.** [An up-to-date stationary spraying plant worked by electricity.] —*Schweiz. Z. Obst- u. Weinb.*, xlvi, 14, pp. 229–232, 2 figs., 1 diag., 1937.

Technical details are given of the installation, construction, and application of a stationary spraying electromotor plant recently erected by the Swiss Federal Experiment Station for Fruit-Growing, Viticulture, and Horticulture at Wädenswil for the control of downy mildew [*Plasmopara viticola*] in a 2-hect. vineyard.

KORDES (H.). **Nekrosen, frühzeitige Blattverfärbungen und Wachstumsstörungen an Reben infolge abnormer Bodenversäuerung.** [Necroses, premature leaf discolorations, and growth disturbances in Vines in consequence of abnormal soil acidification.]—*Wein u. Rebe*, xix, 5, pp. 138–146, 11 pl., 1937. [Abs. in *Neuheiten PflSch.*, xxx, 6, p. 272, 1937.]

Vines in the Palatinate uplands suffer from a disorder expressed by a blackening of the shoots suggestive of infection by a Dematiaceous fungus, subepidermal necroses due to gumming of the disintegrating cell contents, a yellowish-brown discoloration of the leaves, starting at the margins, from June onwards, and by the grapes turning purplish

(instead of the normal golden-yellow) and bursting. Portuguese varieties do not show the foregoing symptoms but are characterized by a reddish tinting of the foliage, described by Zschokke in 1931 as 'sun scorch'. The disturbances in question are attributed to the unduly acid reaction of the local soils (under P_H 4), which may be counteracted by the application of lime at the rate of 5,000 to 6,000 kg. per hect. and incorporation of compost, stable manure, and other fertilizers.

VIVET (E.). **Le court-noué de la Vigne.** [Court-noué of the Vine.]—*Bull. Soc. Agric. Algérie*, lxxx, 498, pp. 73–76, 1937.

In Algeria court-noué of the vine [*R.A.M.*, xvii, p. 95] is prevalent in the sandy soils of the Dahra and various types of silicious soil in the plain of Oran and in the west of the country. Five years ago the disease made its appearance on Carignan vines grafted on Rupestris in the clay soils of the central part of the Soummam Valley, and since then it has spread rapidly, especially in vineyards that have been regularly irrigated three or four times annually for the last 25 years. The disease is most severe on the Aramon variety, followed by Carignan, Cinsault, and Mourvèdre, Chasselas being comparatively resistant. Among the stocks employed locally for grafting, Rupestris du Lot and 3·309 are the most susceptible, while 420 A is not much more resistant; 41 B withstands the disease somewhat better. Under Algerian conditions the association of *Pumilus medullae* [ibid., xvi, p. 587] or other fungi with court-noué is exceptional.

RAVIKOVITCH (S.) & BIDNER (N.). **The deterioration of Grape-Vines in saline soils.**—*Emp. J. exp. Agric.*, v, 19, pp. 197–203, 2 pl., 1 graph, 1937.

In 1934 nine-year-old Chasselas and Muscat Hamburg grape vines growing in clay soil in Palestine began to deteriorate and die as a result of high concentrations of chlorine as sodium chloride developing in the soil following several years of improper irrigation. The affected vines shed their leaves excessively, the berries remained small and shrivelled up, and the branches withered. The tips of the leaves turned yellow and brown spots appeared all over the blades. On badly deteriorated vines the leaves crumbled away. The tips of the shoots became shrunken and dark brown, and died. Analytical data [which are given in full] show that the percentage of sodium chloride in grapes varied from 0·15 (healthy Muscat Hamburg) to 2·47 (severely affected Chasselas) and that of chlorine in the leaves from 0·04 to 3·35, respectively.

WICKENS (G. M.). **Report of the Division of Plant Pathology for the year ending 31st December, 1936.**—*Rhod. agric. J.*, xxxiv, 9, pp. 689–696, 1937.

The following items occur in this report. Symptoms on tobacco, simulating 'kromnek' [*R.A.M.*, xvi, p. 367], in the form of necrosis of the midribs and veins and extensive puckering of the leaf blades, were observed locally, and are believed to have been caused by lightning. On a farm in the Macheke region a severe outbreak occurred of tobacco wilt, isolations from which yielded an organism apparently identical with *Bacterium solanacearum*, but the identity of which needs further confirmation. A condition of maize, similar in its symptoms to the

Florida 'white bud' [ibid., xv, p. 730] and characterized by the fact that newly developing leaves are almost pure white, was fairly prevalent in the Mazoe valley. The occurrence of maize streak [ibid., xv, p. 704] was confirmed by inoculation experiments with the leafhopper (*Cicadulina mbila*). Further work showed that the disease is transmissible by the insect to *Rottboellia exaltata* [ibid., xi, p. 67] and vice versa, indicating that this grass can carry the streak virus from season to season. Similar symptoms were observed on Rhodes grass (*Chloris gayana*) and rapoko grass (*Eleusine indica*).

Young tung oil [*Aleurites fordii*] trees showed a stunting of growth and foliar bronzing, similar to that described from Florida [ibid., xiv, p. 481].

The increasing prevalence of potato common scab [*Actinomyces scabies*] is believed to be in part attributable to the importation of infected seed tubers and it is suggested that it may be checked by only allowing the introduction of certified seed. Internal brown fleck [ibid., xvi, p. 629] is also common, and it is considered that the prevalence of this trouble and of common scab is largely attributable to the practice of growing potatoes in soil deficient in humus.

During the year under review new disease records included root rot of apricot due to *Armillaria* [*mellea*], a dark brown rot of banana stem and pseudostem associated with *Macrophomina phaseoli* [ibid., xiii, p. 494], anthracnose of antirrhinum (*Colletotrichum antirrhini*), leaf spot of cowpea (*Septoria vignae*), green ear disease of *Pennisetum spicatum* (*Sclerospora graminicola*), [ibid., xvi, p. 527], and anthracnose of egg-plant (*C. atramentarium*) [ibid., xvii, p. 60].

STOREY (H. H.). **Report of the Plant Pathologist.** *Rep. E. Afr. agric. Res. Sta., 1936–37*, pp. 17–20, 1937.

In this report [cf. *R.A.M.*, xvi, p. 87] the author states that whereas his earlier studies had shown that the power to transmit the maize streak virus was inherited by the vector *Cicadulina mbila* as a dominant Mendelian factor linked with sex, studies with *C. zeae* and *C. storeyi* (referred to as *C. nicholsi* in the last report) revealed anomalous behaviour apparently inexplicable on this hypothesis, similar anomalous behaviour also being observed on the part of certain lines of *C. mbila*. Active individuals of *C. mbila* vary widely in their efficiency as vectors of maize streak, both in the frequency with which they infect plants during short contacts and also in the length of time that they remain infective after removal from a diseased plant. It may be supposed that the former character depends on the rate of output of virus by the insect while being tested and the latter on the ability of the insect to put out virus without replenishing its stock by feeding on a diseased plant, i.e., on the capacity of the insect to permit multiplication of the virus within its body.

Studies made to determine whether variability in these two respects is genetically determined gave inconclusive results as regards the first but demonstrated that the second type of variability is certainly controlled by genetical factors. Beginning with insects having a very low capacity to remain infective, families were bred and tested up to the eighth generation. From an early stage they showed proportions of

active and inactive individuals that could not be fitted into the scheme of inheritance previously established. The results suggested an explanation on the basis of a second genetic factor modifying the dominance of the factor for activity: in certain combinations the modifying factor might prevent the manifestation of activity in an insect carrying the dominant factor for activity, while in others activity might be only weakly manifested. While much of the evidence supports this hypothesis some appears to conflict with it.

A satisfactory technique has now been devised for the artificial transmission of the cassava mosaic [ibid., xvii, p. 94] virus by whitefly (*Bemisia* sp.). Marked seasonal differences in the rate of secondary spread were noted.

Deighton (F. C.). **Mycological work.**—*Rep. Dep. Agric. S. Leone, 1936*, pp. 44–46, 1937.

This report [cf. *R.A.M.*, xv, p. 778] contains, *inter alia*, the following items of interest. In 1936 at Njala eradication measures against citrus scab [*Elsinoe fawcetti*] succeeded in reducing the number of scabbed citrus trees to under 50 and there is every hope that the disease will be completely eradicated in a year or two. A few more cases of psorosis [ibid., xvii, p. 106] appeared in the sweet orange plot at Njala and the affected plants were destroyed. Citrus canker [*Pseudomonas citri*] has not yet been found in the Colony. Foot rot, possibly caused by *Phytophthora*, was noticed on tangerines at Songo. Pineapples at Newton and Njala were severely attacked by a disease associated with an Asterinaceous fungus which has not yet been identified, but is distinct from *Asterinella stuhlmannii* [ibid., vi, p. 341]. The disease is characterized by brown spots, soon becoming sunken in the centre, which turns grey-brown; linear ascomata, 85 to 425 by 85 μ, opening by a longitudinal slit, appear on the surface when the spots are about 1 cm. in diameter. At Njala in its later stages the disease showed a brown streak some 3 cm. wide down the centre of the leaf; at Newton the spots were confined to the apical half of the leaf which after shrivelling became covered with ascomata. The most susceptible variety of pineapple proved to be Red Spanish, Queen and Smooth Cayenne being moderately resistant, and Baronne de Rothschild almost immune. *Rhizoctonia* [*Corticium*] *solani* was recorded for the first time on *Adenanthera pavonia* seedlings, *Piper nigrum*, and eggplant. The following fungi are also newly recorded: *Cercospora hibisci* on *Hibiscus esculentus*, *Fusarium semitectum* var. *majus* on fruit of eggplant, *Pleocyta sacchari* on sugarcane, *Eriothyrium coccicolum* and *Septobasidium pilosum* [ibid., ix, p. 562] on *Lepidosaphes beckii* on grapefruit, *Hymenopsis* sp., *S. lepidosaphis*, and *Tubercularia coccicola* [ibid., xiii, p. 90] on *L. beckii*, *Chionaspis citri* on grapefruit, and *Aschersonia placenta* and *Aegerita webberi* on scale insects on a forest climber.

Van der Goot (P.). **Ziekten en plagen der cultuurgewassen in Nederlandsch-Indië in 1936.** [Diseases and pests of cultivated crops in the Dutch East Indies in 1936.]—*Meded. Inst. PlZiekt., Batavia*, 89, vii×104 pp., 1937.

Among the numerous records of interest in this report, prepared on

the usual lines [cf. *R.A.M.*, xvi, p. 160], the following may be mentioned. Potatoes continued to suffer heavy damage from slime disease [*Bacterium solanacearum*: ibid., xvii, p. 60], which was observed in the Kedoe Residency, Java, to be more virulent on Eigenheimers than on Paul Kruger [President], Inel, and Bandoeng. In the Manado Residency (Celebes), production fell by some 40 per cent. as a result of the disease. The most extensive losses, however, were caused by *Phytophthora infestans* [loc. cit.], which occurred in a devastating form in the Priangan and Buitenzorg Residencies, Java, the reduction in value of the crop in the former amounting to Fl. 140,000.

With the extended cultivation of the resistant Schwarz 21 variety, the ravages caused by *Bact. solanacearum* in groundnut plantations are gradually decreasing, though considerable damage was reported from a number of districts. The same organism attacked cassava in Buitenzorg and Cheribon.

Citrons and other kinds of citrus in Batavia were attacked by the *Fusarium* stage of *Nectria haematococca* [ibid., xv, p. 498], which sometimes assumes a highly injurious form, girdling the trees at the stem base. Among the many other pathogens of citrus were mildew [*Oidium tingitaninum*: ibid., xvi, p. 153], *Nematospora coryli* (on rough lemon fruits) [ibid., xvi, p. 86], *Dothiorella* [*Botryosphaeria*] *ribis* (on mandarin oranges) [ibid., xi, p. 172], and white root rot (*Armillaria*) [*mellea*: ibid., xv, pp. 213, 280; xvi, p. 451], the last-named being successfully (but very expensively) combated by applications of sulphur to the root system combined with liming of the trunk and spraying the tree with Bordeaux mixture.

Coco-nuts (especially of the dwarf type) in the Riouw Residency, Sumatra, were affected by a wilt disease associated with *Ganoderma lucidum* and *Marasmius palmivorus* [ibid., xvi, p. 657], the latter in a secondary capacity.

Fomes noxius was widespread on the roots of coffee [ibid., xvi, p. 798]. K. Boedijn's studies on *Polyporus coffeae* are stated to have demonstrated the identity of this organism with *Bornetina* (?) *corium* [ibid., xiv, p. 357].

Clove seedlings in the Lampongs (Sumatra) were attacked by *Glomerella* and *Gloeosporium*, for the control of which Bordeaux mixture was applied.

Pepper [*Piper nigrum*] foot rot (*Phytophthora*) [*palmivora* var. *piperis*: ibid., xvi, p. 560] was responsible for irretrievable damage in Atjeh and also destroyed the susceptible varieties Djambi and Korinti in the Lampongs, where the supposedly resistant lada belantoeng was also slightly attacked.

In addition to the tea diseases already enumerated from another source [ibid., xvi, pp. 634, 798], the occurrence on this host of *Armillaria fuscipes* [ibid., xiv, p. 86] at high altitudes in West Java and of *Asterina camelliae* in West Sumatra [ibid., xiii, p. 687] may be mentioned.

Among the fungi recorded on cinchona was *Polyporus rubidus* [ibid., v, p. 843] in West Sumatra.

Pokkah-boeng (*Fusarium moniliforme*) [*Gibberella moniliformis*] was again the most important disease of sugar-cane in Java. Leaf scald (*Bacterium albilineans*) was more in evidence than in the previous year,

infection being spread by the use of insufficiently well selected planting material.

Root rot of rice [ibid., xv, p. 312; xvi, p. 339] was exceptionally virulent and widespread in Buitenzorg, Cheribon, Bodjonegoro, Kediri, and Pasoeroean (Java).

Most of the information concerning tobacco diseases has already been noticed [ibid., xvi, p. 779], but attention may here be drawn to the occurrence of stem scorch due to *Pythium* and *Rhizoctonia* [*Corticium*] *solani* [ibid., xiv, p. 743; xv, p. 403] in Sumatra, the latter fungus also being reported by the Besoeki Experiment Station (Java), where severe damage was further caused by *P. aphanidermatum* [ibid., xiv, pp. 153, 473, 743].

Sclerospora javanica was widespread on maize in the Soerakarta district of Java and elsewhere as a result of the exceptionally heavy rainfall in the early west monsoon of 1936–7.

STAPP (C.). **Der parasitäre Pflanzenkrebs.** [Parasitic crown gall of plants.]—*Neuere Ergeb. Krebskr.*, pp. 168–175, 3 figs., [? 1937].

The writer summarizes some recent studies by himself and others on the crown gall of plants caused by *Pseudomonas* [*Bacterium*] *tumefaciens* and briefly discusses the relationship of the disease to human cancer [*R.A.M.*, xvi, p. 88].

KATZNELSON (H.). **Bacteriophage in relation to plant diseases.**—*Bot. Rev.*, iii, 10, pp. 499–521, 1937.

A review, followed by a bibliography of 79 titles, is given of the current literature on the phenomenon of bacteriophagy in relation to plant diseases, with a section on its application to the therapy of certain animal maladies. Much of the work connected with phytopathology has been noticed from time to time in this *Review*.

KNAPP (A. W.). **Cacao fermentation: a critical survey of its scientific aspects.**—xii+171 pp., 1 col. pl., 38 figs., 4 diags., 5 graphs, London, John Bale, Sons & Curnow, Ltd., 1937. Price 10*s*.

Included in this critical review of the scientific aspects of cacao fermentation are two chapters dealing with the yeasts, bacteria, and moulds [*R.A.M.*, xii, p. 149] encountered on the beans at various stages of ripening. Most of the work, e.g., by H. A. Dade and R. H. Bunting in the Gold Coast, T. Laycock in Nigeria, and R. Ciferri in Dominica, cited in connexion with mould spoilage has been noticed in this *Review*. A bibliography of 145 titles is appended.

BULLER (A. H. R.). **Fusions between flexuous hyphae and pycnidiospores in Puccinia graminis.**—*Nature, Lond.*, cxli, 3557, pp. 33–34, 3 figs., 1938.

The writer recently observed, after mixing the pycnidial nectar of *Puccinia graminis*, the agent of black stem rust of wheat, on a barberry leaf, from 80 to 100 fusions between a flexuous hypha of one sex and a pycnospore of opposite sex [*R.A.M.*, xii, p. 318]. Each pycnidium sends out into the nectar 60 to 70 periphyses (straight, pointed red hairs) and a smaller number of flexuous hyphae, some of which are

branched. Several hours after the mixture of the pycnidial nectar, transverse sections of the living leaf and pycnidial pustules were mounted in water and microscopically examined. The fusion of a flexuous hypha with a pycnospore may take place either at the end or side of a flexuous hypha; in the latter case the hypha sends out towards the spore a so-called 'fusion peg' [ibid., xii, p. 777]. Shortly after fusion the main protoplasmic contents migrate from the pycnospore and from the part of the flexuous hypha that has fused with the spore, leaving behind a large vacuole. Presumably the nucleus of the pycnospore passes down the non-septate flexuous hypha towards the aecidial fundaments or proto-aecidia; these are well-defined haploid organs which after becoming diploidized develop into normal aecidia.

Young (P. A.). **Natural infection of grasses with Puccinia graminis.** —*Phytopathology*, xxvii, 10, p. 1028, 1937.

During an epidemic of wheat stem [black] rust (*Puccinia graminis*) in North Dakota in 1935, severe damage was sustained by five species of grass seedlings in nursery rows provisionally identified as *Agropyron inerme*, *A. spicatum*, *Deschampsia atropurpurea*, *Elymus condensatus*, and *Poa bulbosa*. The following species produced abundantly infected heads: *A. pauciflorum*, *A. semicostatum*, *A. smithii* (with the exception of one semi-immune strain), *A. strigosum*, *A. violaceum*, *Avena fatua*, oats, *Elymus canadensis*, *Hordeum jubatum*, and barley. *A. cristatum* proved to be immune from the rust, and *A. sibiricum*, *Bromus anomalus*, *E. pseudoagropyron*, and *E. virginicus* were only mildly infected.

Dionigi (A.). **Sullo svernamento delle ruggini (nota 1).** [On the overwintering of rusts (first note).]—*Riv. Pat. veg.*, xxvii, 9–10, pp. 275–279, 1937.

The author suggests that the perpetuation of rusts, and more particularly the wheat rusts (*Puccinia glumarum*, *P. graminis*, and *P. triticina*), from year to year in Italy [*R.A.M.*, xvi, p. 593] is ensured by the uredospores, which after their discharge on the soil or dead plant residue go through a 'lethargic' [dormant] state induced by the hot and dry summer conditions, and return to active life at the onset of winter or early spring conditions. Arguments based on general observations are given in support of this view.

Rodenhiser (H. A.) & Holton (C. S.). **Physiologic races of Tilletia tritici and T. levis.**—*J. agric. Res.*, lv, 7, pp. 483–496, 1937.

A tabulated account is given of experiments from 1934 to 1936, inclusive, carried out under comparable conditions in Montana, West Virginia, and Washington, in which 24 collections of *Tilletia tritici* [*T. caries*] and 29 of *T. levis* [*T. foetens*], each identified as a distinct physiological race of either species [*R.A.M.*, xvi, pp. 166, 517] by previous investigators, together with a number of miscellaneous collections of both species, were tested on ten differential varieties of winter and spring wheats [which are listed]. The limits of the classes of infection used in this work were somewhat widened from those admitted formerly, the varieties showing 0 to 10 per cent. infection being listed

as resistant, those exhibiting 11 to 40 per cent. infection as intermediate, and 41 to 100 per cent. as susceptible. On this basis a number of the collections tested appeared to be duplicates; eleven physiological races of *T. caries* and eight of *T. foetens* were pathogenically distinct, and have been assigned letters and race numbers T–1 to T–11, and L–1 to L–8 respectively. The fact that certain races could be differentiated on winter wheats alone, some by their reaction on spring wheats, and some more by their reaction on the combination of both kinds of wheat, emphasized the importance of including both winter and spring wheats among the differential hosts. The possibility of separating certain physiological races from mechanical mixtures of bunt by inoculations on wheat varieties generally considered to be completely susceptible was indicated by the fact that Ulka, completely susceptible to most races, was found to carry factors for resistance to T–10 and T–11. Besides differing in pathogenicity, a number of the races also varied in morphological characters of the chlamydospores and smut balls, the colour of the spore masses, and in their effect on the host plants in regard to stunting, dropping of the awns, and the degree of laxness in the spikes. Different environmental conditions determined variations in the response of Turkey (C.I. 6175) and Mindum (C.I. 5296) to certain physiological races, but not to others, and evidence was obtained that these variations were apparently due to the effect of environment on the host rather than on the parasite.

From the wheat-breeder's standpoint the results are considered to suggest the possibility of developing new varieties combining resistance to all the known bunt races with other desirable agronomic characters.

Ajroldi (P.). **Nuove ricerche intorno alla biologia delle 'Tilletia' del Frumento.** [Further investigations on the biology of *Tilletia* on Wheat.]—*Riv. Pat. veg.*, xxvii, 9–10, pp. 297–319, 1 pl., 1 diag., 3 graphs, 1937.

The results of experiments in 1936–7 at the Technical Agricultural Institute 'C. Gallini' at Voghera indicated that heavy fertilization with potassium chloride favoured the infection of the Mentana, Villa Gloria, and Damiano Chiesa wheats with bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*], while heavy applications of ammonium sulphate had the opposite effect, and superphosphate did not appear to exert any influence on infection. Of the three wheat varieties tested Mentana was the most susceptible, the percentage of infection in the plots sown to it varying from 22·4 to 41·1, as against 9·5 to 24 in the Villa Gloria and 7 to 19·6 in the Damiano Chiesa plots. The heavy infection of Mentana in 1937, following a cold and wet autumn, compared with the average of 8·5 per cent. infection in the 1935–6 trials, when the autumn was much milder and drier, again confirmed the direct bearing of environmental conditions on the susceptibility of wheat seedlings. In plots raised from seed artificially infected with both bunt species, the plants were found to be infected by each in almost equal proportions, and histological examination showed the simultaneous presence of both species in the same ear and in the same wheat grain. Attempts to induce bunt infection from the soil by wounding the roots were unsuccessful.

Milan (A.). **Prove estive sull' 'Ustilago tritici' (Pers.) Jens. con varietà di Grano precoci.** [Summer experiments on early Wheat varieties with *Ustilago tritici* (Pers.) Jens.]—*Riv. Pat. veg.*, xxvii, 9–10, pp. 287–296, 1937.

A brief description is given of a method by which the author succeeded in inducing the seed of early wheat varieties, inoculated in the spring with *Ustilago tritici* [*R.A.M.*, xvi, p. 239] and harvested as early as mid-June, to germinate and grow in small boxes to full maturity and to produce fully developed new seed by the end of the following September. This method was used by him in experiments with a number of wheat varieties from 1931 to 1937, inclusive, and the results [which are tabulated] showed it to be effective in determining the percentage of infection resulting from the spring inoculation with loose smut, prior to the normal time of sowing the grain in the autumn. The results are also stated to have again confirmed the high susceptibility to *U. tritici* of the Mentana, Rachael, and Grano 28 Ottobre wheats, and the high resistance of Littorio and of the Federation × Khapli cross. The first generation of a cross of this hybrid with Mentana and of its reciprocal was also very resistant, indicating the probability that in the Federation × Khapli hybrid resistance is dominant.

Fron (G.). **Nouvelles observations sur la maladie du piétin des céréales (campagne 1937).** [New observations on the foot rot disease of cereals (campaign of 1937).]—*C. R. Acad. Agric. Fr.*, xxiii, 25, pp. 792–800, 1 diag., 1937.

Details are given of the writer's further experiments in the control of *Cercosporella herpotrichoides* on wheat [*R.A.M.*, xv, p. 145], from which it appears that the best results were given by an autumn treatment of the seed-grain with neutral ortho-oxyquinoline sulphate [ibid., xvi, p. 350] (dusting at the rate of 30 gm. per quintal or immersion in a solution of 30 gm. in 8 l. water per quintal), followed towards the end of March by the application to the soil of 100 gm. ortho-oxyquinoline sulphate incorporated in 200 kg. complete fertilizer per hect. The estimated increase of yield thus obtained amounted to between 12 and 15 per cent. Seed treatment alone augmented the yield by 2 and fertilizing alone by 4·31 quintals per hect. The action of ortho-oxyquinoline sulphate on plants appears to be of the very delicate order associated with the operation of phytohormones.

Hynes (H. J.). **Studies on Rhizoctonia root-rot of Wheat and Oats.**—*Sci. Bull. Dep. Agric. N.S.W.* 58, 42 pp., 18 figs., 1937.

Heavy losses may be caused in certain limited areas of the New South Wales, South Australia, and Victoria wheat belt by a root rot of wheat and oats due to *Rhizoctonia* [*Corticium*] *solani* [*R.A.M.*, xiv, p. 559; xv, p. 24; xvi, p. 801; xvii, p. 97], which develops during the winter months and may abate to some extent with the onset of milder conditions. Infection occurs in the field in the shape of well-defined, circular or irregular patches, ranging from about 1 ft. in diameter to areas covering $\frac{3}{4}$ acre or more, and presenting from a distance a slightly purplish appearance, especially in the case of oats, or sometimes a conspicuously yellow tinge. Such plants as recover from the disease are stunted, of a

darker green than the normal, late in maturing, and bear few tillers and small heads. Where recovery does not take place, as on poorly prepared land, the plants die out in patches in the early spring, leaving prominent 'holes' throughout the crop. Oats are more likely than wheat to recuperate after early infection. The average height of diseased wheat plants was found to be only 4½ in. as against 11 in. for healthy ones, the corresponding figures for shoot numbers being 1 and 2½, respectively. The leaves of affected plants (about four per seedling) are very narrow, rolled, erect, and sometimes exhibit a more or less extensive purplish tinge (naphthalene violet and vernonia purple of Ridgway). Both the primary and secondary root systems were rotted, the former being poorly developed and measuring ½ to 3 in. in length and the latter composed of three or four diseased stubs, ⅛ to 1 in. long. Diseased roots are readily decorticated, the portion thus exposed being of a dull tan colour and containing the characteristic hyaline hyphae of the fungus, 9 to 10 μ in diameter. The basal sheaths are of a marked tan colour and occupied by both hyaline and brown hyphae, the latter measuring 6·6 to 9·9 μ in diameter. The symptoms on oats are similar to the foregoing. The average height and shoot number of affected plants are 4 in. and 1½, respectively, as compared with 12 in. and 5 for healthy specimens. Each diseased seedling bears only about five leaves and the growth habit is erect and stiff. The purplish discoloration, when present, is much darker than that of wheat, agreeing closely with Ridgway's cotinga purple. Injury to the root system is similar to that described for wheat but generally less extensive.

Two cereal strains of *C. solani*, exhibiting marked differences in growth rate on agar and in pathogenicity on seedlings, were isolated from diseased plants, the optimum temperature for the development of one being 20° and of the other 20° to 25° C. The addition of ammonium sulphate to glucose or 'radicicola' agar in amounts constituting 0·5 to 0·25 per cent. of the medium retarded the growth of the pathogen. The results of extensive cross-inoculation experiments showed that strains of *C. solani* from cereals and potato are capable of inducing marked stunting in Nabawa wheat, Algerian oats, Cape Barley, and Black Winter rye seedlings and Factor potato shoots.

Relatively low temperatures were shown by field observations and greenhouse tests to favour the development of root rot in wheat and oats. In controlled trials soil moisture was not a limiting factor in the incidence of infection at low temperatures, but at high ones the symptoms were most severe in soils with a low moisture content. In striking contrast to *Helminthosporium sativum* and *H.*M. [*Curvularia ramosa*: ibid., xvi, p. 735], which were tested concurrently, *Corticium solani* is of comparatively slight importance in the causation of pre-emergence blight.

Chemical analyses of soil samples from the diseased areas revealed a relatively low lime content (P_H 6 to 6·3). In an extensive series of pot experiments, calcium hydrate, ammonium sulphate, and horse manure each inhibited the development of root rot in Nabawa wheat, with residual effects in the case of the two first named. The results of three years' field tests indicated that the application of ammonium sulphate to the soil at the rate of 1 or 2 cwt. per acre exerts a definitely curative

effect in the case of Buddah oats, but is of questionable value with wheat.

SIMMONDS (P. M.) & LEDINGHAM (R. J.). **A study of the fungous flora of Wheat roots.**—*Sci. Agric.*, xviii, 2, pp. 49–59, 1 pl., 1 fig., 1937.

A full list is given of the fungi (comprised in 27 genera) identified by the authors among 806 isolates from the subcrown internode and the roots of wheat plants excavated in 1935 and 1936 at Saskatoon and Indian Head, Saskatchewan, in connexion with their studies of the wheat root rot problem in Canada [*R.A.M.*, xiv, p. 748]. The majority of the fungi were isolated from the plant organs developing in the first foot of soil from the surface, in which well-known species pathogenic to cereals were also the most abundant, such as *Helminthosporium sativum* and *Fusarium* spp., representing roughly 10 and 40 per cent., respectively, of all the isolates and rarely occurring at greater depths. Most of the species obtained from the lower levels were slow growing forms, including *Geomyces vulgaris*, *Botrytis* sp., *B. terrestris*, and *Cylindrocarpon* sp., but certain species, such as *Colletotrichum* sp. and *Penicillium* sp. were present at most levels. While the *Colletotrichum* was severely parasitic to wheat, the pathogenic significance of *Penicillium* sp., as well as that of *G. vulgaris* and *Cylindrocarpon* sp., as far as cereals are concerned, is difficult to evaluate at present. *Cephalosporium curtipes*, isolated from a depth of 3 ft., and *Trichoderma koningi* were virulently pathogenic to wheat seedlings in laboratory tests. Isolations in 1935 from decayed, presumably old cereal roots collected at various levels in the soil, yielded, in addition to a fungal flora similar to that obtained from living roots, other species among which the following may be mentioned: *Fusarium sambucinum* [ibid., xv, p. 643] and *F. solani* from the first foot, and *Monotospora daleae* [ibid., xv, p. 741] from the second foot layer. A brief description is given of a Phycomycetous fungus, considered to be of the mycorrhizal type, which was commonly seen in many of the seminal root collections. Direct microscopical examination of preserved material showed that lesions of the roots are of rare occurrence below the first foot of soil.

STEYAERT (R. L.). **Présence du Sclerospora maydis (Rac.) Palm (S. javanica Palm) au Congo belge.** [The presence of *Sclerospora maydis* (Rac.) Palm (*S. javanica* Palm) in the Belgian Congo.]—*Publ. Inst. nat. Étud. agron. Congo belge*, Sér. sci. 13, 16 pp., 1 pl., 1937.

In connexion with the detection in the Uele district of the Belgian Congo of *Sclerospora maydis* [*R.A.M.*, xi, p. 546] on maize, the writer describes the symptoms of the disease and the morphology of the causal organism, discusses the taxonomy of the latter and of related species of *Sclerospora*, and briefly summarizes the very fragmentary knowledge available concerning the distribution of members of this genus in Africa.

[JENSEN (J. H.).] **Plant-disease investigations.**—*Rep. P.R. agric. Exp. Sta., 1936*, pp. 67–69, 1 fig., 1937.

The following item occurs in the course of a report on phytopathological investigations in Porto Rico in 1936. Seeds from healthy maize plants and those suffering from stripe [*R.A.M.*, xv, p. 529] were planted

separately in a cage screened to exclude the insect vector, *Peregrinus maidis*, and also in unprotected areas exposed to leafhopper infestation. No pathological symptoms appeared on any plants developing from seed from diseased plants when protected against insect contamination, whereas 30 out of 583 plants from the same lot of seed but unprotected contracted symptoms. Similar results were obtained with seed from healthy plants. These data are considered to indicate that seed transmission of maize stripe rarely, if ever, takes place.

CHERIAN (M. C.) & KYLASAM (M. S.). **Preliminary studies on the 'freckled yellow' and 'stripe' diseases of Cholam.**—*Proc. Ass. econ. Biol., Coimbatore, 1936*, iv, pp. 57–63, 1 pl., 1937.

Sorghum in the Coimbatore district of India is subject to two forms of leaf-yellowing [cf. *R.A.M.*, xv, p. 778], one designated 'freckled yellow' and the other 'stripe'. The former condition is characterized by minute, creamy-yellow specks arranged in a linear series either near the midrib or close to either margin of the leaf blade. With each successive leaf the intensity of the freckling increases until the specks finally coalesce to form broad, yellow bands. In severe cases the top leaves do not unfurl properly but remain close and twisted, while the apical shoot assumes an arched form like whipcord. Such plants seldom produce ear-heads. In the 'stripe' form of the disorder the leaf blades exhibit a few parallel, contiguous, pale green streaks, while the veins and the immediately adjacent tissue become lighter in colour. The interveinal area is occupied by two or three semi-continuous white streaks running parallel to the veins. The shortened internodes impart a 'bunchy top' aspect to the plant, the colour of which as a whole is an unusually light green. Both these types of yellowing may co-exist in a single plant. The total incidence of both disturbances was shown by counts made from October to December, 1935, to amount to about 14 per cent. of the stand, the corresponding figure in 1936 being 26·5 per cent. 'Freckled yellow' is the more infectious of the two conditions and in 1935 reduced ear head production by nearly 50 per cent. Ragi [*Eleusine corocana*], cumbu [*Pennisetum typhoides*], and maize have been observed to manifest symptoms closely resembling the foregoing, and moreover the shoot bug (*Peregrinus maidis*), which was experimentally shown to transmit freckling (but not stripe) from diseased to healthy plants, breeds on all these cereals. Analogous markings were further noticed on various grasses, such as *Brachiaria ramosa*, *B. distochya*, and *Dichanthum annulatum*, which may possibly act as alternate hosts of the virus evidently concerned in the etiology of the yellowing.

Plant diseases. Notes contributed by the Biological Branch.—*Agric. Gaz. N.S.W.*, xlviii, 9, pp. 501–504, 5 figs., 1937.

Leaf-yellowing of citrus appeared suddenly in New South Wales about 1930 on sand and sandy loam soils, causing reduction of crop and vigour of growth but no actual die-back of the twigs. The young foliage was quite normal in spring but diffuse yellow blotches developed on the leaves in early autumn, and the chlorotic leaves were shed prematurely. Chemical analyses showed a deficiency of magnesium both in the diseased

leaves and in the affected soils. Applications of dolomitic limestone at the rates of ½ ton and 2 tons per acre applied in 1932 to badly affected 5-year-old Valencia oranges resulted in marked improvement, which first became evident in the autumn of 1935 and has been maintained since except that the trees given the ½ ton dressing showed slight leaf-yellowing in 1935–6. An early spring dressing of 1 ton per acre is recommended.

Notes are also given on wheat stem rust [*Puccinia graminis*], estimated to cause an annual loss of £250,000 to the State, control of apple black spot [scab] (*Venturia inaequalis*), and bacterial blight [*Bacterium medicaginis* var. *phaseolicola*] of beans [*Phaseolus vulgaris*]. Against the last-named disease the Department of Agriculture has fostered the production of high-grade seed from clean crops and within a few years all the bean seed required will probably be produced locally.

Benton (R. J.). **Mottle leaf of Citrus trees. Control by zinc sulphate sprays demonstrated.**—*Agric. Gaz. N.S.W.*, xlviii, 10, pp. 571–572, 580, 3 figs., 1937.

Mottle leaf of citrus trees [*R.A.M.*, xvii, p. 106] is stated to be common in citrus trees growing under irrigated conditions in inland areas of New South Wales. In experiments in 1936–7 at Curlwaa and Leeton, on Navel, Valencia Late, and Mediterranean Sweet orange trees, some of which showed 80 to 90 per cent. mottle leaf, striking improvement resulted from the application in mid-September of a spray consisting of 10 lb. zinc sulphate, 5 lb. hydrated lime, and 4 oz. black albumen spreader in 100 galls. water. The improvement was not quite so marked, though definite, when the trees were sprayed in November and January.

Mendes (L. O. T.). **Resultados experimentais obtidos num estudo sobre os meios de combate a 'verrugose' (Sphaceloma australis Bit. & Jenk. 1936) da Laranja doce (Citrus sinensis Osb.).** [Experimental results obtained in the study of methods of combating 'scab' (*Sphaceloma australis* Bit. & Jenk. 1936) of the Sweet Orange (*Citrus sinensis* Osb.).]—Reprinted from *Rev. Agric., S. Paulo*, xii, 8–9, 27 pp., 1937. [English summary.]

A tabulated account is given of the writer's experiments at Sorocaba, São Paulo, Brazil, in the control of sweet orange scab, caused by *Elsinoe* (*Sphaceloma*) *australis* [*R.A.M.*, xvii, p. 27], from which it appears that 1 per cent. Bordeaux mixture is more effective for this purpose than solbar or Bayer's Bordeaux dust. Two applications are generally sufficient, the first to be made immediately after flowering and the second some 60 days later, when the fruits attain a diameter of 1·5 cm. The addition of mineral oil to the mixture is advisable for the simultaneous control of coccids.

Bitancourt (A. A.). **As prodridões das Laranjas na safra de 1936.** [Rots of Oranges in the 1936 crop.]—*Biologico*, iii, 9, pp. 255–263, 1 pl., 1 graph, 1937.

The results of the mycological investigation of 18 boxes of Pera and Bahia oranges received from June to September, 1936, inclusive, at

São Paulo from various citrus-growing centres in the States of São Paulo, Rio de Janeiro, and the Districto Federal in Brazil, showed that the oranges coming from the two last-named areas and the 'Central' region of the State of São Paulo were chiefly attacked by stem-end rot mostly caused by *Phomopsis* [*Diaporthe*] *citri* and to a lesser extent by *Diplodia natalensis* [*R.A.M.*, xvi, p. 744] and *Dothiorella* [*Botryosphaeria*] *ribis*. As far as the author is aware, this is the first record of *B. ribis* on orange from Brazil, where it was found, however, causing a black rot of avocado pear. The oranges from the remainder of the State of São Paulo were mostly attacked by green rot (*Penicillium digitatum*), and to a lesser degree by blue mould (*P. italicum*). A total not exceeding 5 per cent. of all the fruits examined were found to be rotted by *Rhizopus nigricans*, *Colletotrichum gloeosporioides*, *Oospora citri-aurantii* [ibid., xvi, p. 601], and some other undetermined fungi.

Baker (R. E. D.). **Gummosis of Citrus in Trinidad. III. Notes on the control of the disease in old plantations.**—*Trop. Agriculture, Trin.*, xiv, 9, pp. 255–256, 3 figs., 1937.

The experiment described in this paper was carried out during 1934–7 on a block of 572 Marsh grape-fruit trees from 9 to 12 years old, almost all of which were low-grafted and had low branches reaching the ground, in a field where the conditions are generally calculated to be favourable to gummosis (*Phytophthora parasitica*) [*R.A.M.*, xvi, p. 312] in Trinidad. A survey in 1934 showed that 162 of the trees (28 per cent.) were attacked by the disease to a greater or lesser extent, and that 39 were already dead. The trees were drastically pruned and trimmed until the trunks were cleared of all foliage within 5 or 6 ft. from the ground, no antiseptic dressing being used to cover the wounds. All the infected bark was then carefully excised until clean, healthy tissue could be seen all around the lesions, the operation being performed at the height of the dry season, and the wounds left simply to dry and heal without the use of any antiseptic; under wet conditions the use of Bordeaux paste, followed by Stockholm tar or some other similar dressing, might be advisable. Furthermore, all the diseased trees were inarched on to two, three, or four sour orange plants of varying sizes and ages, with the result that many of the more seriously attacked trees (25 out of 44) have been saved, and are giving good crops of fruit. These measures are claimed to have effectively arrested the disease in 122 trees by April, 1937, and, of the 162 trees that had been treated in 1934, 80 have never been attacked since. Most of the dead trees in the experimental field have been replaced with young high-grafted trees, and the whole field is stated to be now in a better condition than in 1934 and to be capable of yielding good crops for many years to come. The results show undoubtedly that gummosis can be successfully controlled under Trinidad conditions even on trees of a type liable to the disease.

Rudin (W.). **Topsterftebestrijding in de practijk. III.** [Top die-back control in practice. III.]—*Bergcultures*, xi, 41, p. 1471, 1937.

The writer considers that in combating top die-back of coffee [*Rhizoctonia* sp.: *R.A.M.*, xvii, p. 108], it is of the utmost importance

to guard against the penetration of the fungus through pruning wounds. The coolies' practice of carrying baskets piled up with excised debris through a densely planted estate is deprecated, and in the absence of arrangements for burning on the spot, the baskets should not be filled to the brim and should be covered with sacking before transport. They should be immersed overnight in a fungicidal solution. The disinfection of pruning saws and knives after the treatment of each tree or group of trees is also advisable.

HENDERSON (LETA). **Studies on the infection of Cotton seedlings by Phymatotrichum omnivorum.**—*Amer. J. Bot.*, xxiv, 8, pp. 547–552, 3 figs., 1937.

Using a culture medium (either as liquid or in sand) suitable for green plants with sufficient dextrose added to permit the growth of the cotton root rot fungus, *Phymatotrichum omnivorum* [*R.A.M.*, xvii, p. 109], experimental infections were carried out under controlled conditions, the Acala cotton seed used being disinfected and the seedlings raised under sterile conditions before transference to the culture tubes inoculated with the fungus. The results showed that infection of the cotton seedlings occurs at the surface of the medium only in the presence of oxygen approximating to atmospheric concentrations. Waterlogged conditions in the soil therefore would tend to prevent infection, which would be limited to the moist soil surface above the water table. The thermostable staling products of *P. omnivorum* effectively check the growth of cotton roots and might be expected to check the development of the plant in the field, but probably this does not take place since the staling products are adsorbed and decomposed. Cultures of the fungus freshly isolated from field material show higher rates of growth and infection than they exhibit after culture for several months. Virulence of the fungus is largely a matter of vigour of growth, but cultures attenuated by prolonged growth on artificial media may be reactivated by two or more passages through living cotton plants. In the field, therefore, rapid spread would not be expected from saprophytic sources of infection but only from the fungus in an active parasitic phase. The interpolation of a resistant rotational crop may therefore decrease subsequent infection, whereas susceptible weeds may be the means of perpetuating virulent cultures over a period when cotton is not grown.

THOM (C.) & MORROW (MARIE B.). **Experiments with mold inoculation in Cotton root rot areas.**—*Proc. Soil Sci. Soc. Amer., 1936*, i, p. 223, 1937. [Mimeographed.]

Following up King's hypothesis that cotton root rot (*Phymatotrichum*) [*omnivorum*] becomes dominant as a result of the continuous production of the crop on certain neutral to alkaline soils, the writers found that few or none of the moulds shown by recent studies to be antagonistic to the pathogen were present in rot-infected areas. A selected series of such moulds, e.g., *Trichoderma* [? *lignorum*, *R.A.M.*, xiv, p. 739], inoculated into experimental plots, were recovered in sufficient numbers to justify further investigations along the same lines.

Schepkina [Shtshepkina] (Mme T. V.). Микрохимический способ обнаружения микрофлоры и производимого ею повреждения внутри Хлопковых волокон. [A microchemical method for the determination of the microflora present in Cotton fibres and of the injury caused by it to the fibres.]—*Bull. Acad. Sci. U.R.S.S., 1937*, Sér. biol., 3, pp. 619–634, 1 col. pl., 2 figs., 1937. [English summary.]

The author states that in the course of colorimetric studies involving the use of bromphenol blue as indicator, primarily designed for the determination of the degree of maturity of cotton fibres, it was frequently observed that individual fibres did not stain uniformly over the whole of their length, but presented a spotted or speckled aspect. Further investigations showed that these irregularities in staining were due to the presence, both outside and inside the fibres, of a complex microflora, containing organisms capable of destroying cellulose, since the tensile strength of such fibres was found to be considerably impaired. The examination of a wide range of American and Egyptian baled cottons imported from abroad showed the presence in them of a high percentage (occasionally as much as 80 per cent.) of such fibres. While no systematic study of the microflora was undertaken, it was noted that it comprised widely differing organisms, including besides two bacterial strains, resembling *Bacillus mesentericus* and *B. subtilis*, respectively, species of *Penicillium* and *Aspergillus*, and an Actinomycete, a very minute fungus which was very frequently found growing spirally around the fibres and actively destroying the cellulose of their walls. The same fungus was also detected, with the help of bromphenol blue, growing in the walls of the fibres, in the seeds still enclosed in the bolls, and in the leaves of cotton plants collected in 1936 in Azerbaijan as suffering from a virus disease. The fungus eventually forms on the surface of fibres mulberry-shaped, bright lilac, but later blue fruiting bodies, which break up and liberate hyaline spores.

Sparrow (F. K.). **Some Chytridiaceous inhabitants of submerged insect exuviae.**—*Proc. Amer. phil. Soc.*, lxxviii, 1, pp. 23–60, 4 pl., 5 figs., 1937.

A remarkable fungus flora has been observed to develop in the submerged exuviae (cast-off integuments) of midges (Chironomidae), mayflies (Ephemerida), dragonflies (Odonata), and caddis flies (Phryganeidae), consisting largely of Chytridiales [*R.A.M.*, xv, p. 670], though representatives of the Saprolegniales, notably *Aphanomyces* spp., may also be present. Nine species of the former family, collected in Denmark, England, and the United States, are described in considerable detail; four of these are apparently new to science and are furnished with English and Latin diagnoses.

Lepesme (P.). **Sur la présence du Bacillus prodigiosus chez le Criquet pélerin (Schistocerca gregaria Forsk).** [On the presence of *Bacillus prodigiosus* in the Desert Locust (*Schistocerca gregaria* Forsk).]—*Bull. Soc. Hist. nat. Afr. N.*, xxviii, 6, pp. 406–411, 1937.

Bacillus prodigiosus was isolated on peptonized meat bouillon and on agar from the blood of adult desert locusts (*Schistocerca gregaria*)

which succumbed to an epidemic developing at the Central Laboratory of Locust Biology, Natural History Museum, Algiers, at the end of December, 1936, and persisted throughout the following January. Shortly after death the bodies of the diseased insects assumed a characteristic reddish tinge, especially on the abdomen.

E. Masera's experiments on silkworms (*Bombyx mori*) at Padua showed that inoculation with *B. prodigiosus* is fatal, whereas the results of ingestion of the organism vary with the age of the insects, larvae of the fifth stage being much more susceptible than younger ones [*R.A.M.*, xvi, p. 530], as is also the case with *S. gregaria*. According to the same authority, *Pyrausta nubilalis* is killed by *B. prodigiosus* both by inoculation and ingestion, while in the case of *Galleria mellonella* only the former method produces lethal results. In the writer's experiments, *B. prodigiosus*, just isolated from sick or dead locusts, killed individuals of *S. gregaria* in 12 hours by inoculation and in 24 by ingestion, whereas after repeated subculturing the former method only was effective and death was delayed for three days. It was not possible to recover *B. prodigiosus* from the alimentary canal of the infected locusts, but only from the blood. The presence of the pathogen in the eggs, however, was clearly demonstrated by the red colour of their interior.

Preininger (T.). **Durch Maisbrand (Ustilago maydis) bedingte Dermatomykose.** [Dermatomycosis caused by Maize smut (*Ustilago maydis*).]—*Arch. Derm. Syph., Berl.*, clxxvi, 2, pp. 108–113, 3 figs., 1937.

The agent of maize smut (*Ustilago maydis*) [*U. zeae*: *R.A.M.*, xvi, p. 738] was isolated in October, 1936, from the epithelial layers of extensive inflamed areas on the body and extremities of a Hungarian agricultural labourer. A comparison of the organism with the fungus from a maize plant in the field where the work was carried on left no doubt as to its identity.

Conant (N. F.). **Studies in the genus Microsporum. III. Taxonomic studies.**—*Arch. Derm. Syph., Chicago*, xxxvi, 4, pp. 781–808, 7 pl., 1937.

A detailed study of nine representative species of *Microsporum* [*R.A.M.*, xv, p. 721] (Gruby's original spelling though he used *Microsporon* the next year) is presented, the morphological characters essential to the recognition of the species having been developed on polished rice cultures. The most important feature from the standpoint of specific differentiation was the macroconidia (fuseaux) produced in culture, which are characterized according to size, shape and character of the wall, and colour. Subsidiary characters, such as arrangement, size, and character of the conidiophores, and methods of macroconidial production, were also observed and taken into consideration for a clear definition of the species, a key to which is included for convenient and easy identification. Full technical descriptions are given of all the species studied, including five old species recognized as valid, viz., *M. audouini*, *M. canis*, *M. equinum*, *M. fulvum*, and *M. gypseum*, and four new ones, *M. aurantiacum*, *M. pseudosolanosum*, *M. simiae*, and *M. obesum*, which are accompanied by Latin diagnoses.

M. aurantiacum, isolated from the scalp of a boy, is characterized by cinnamon-coloured colonies, conidiophores 35 to 120 by 2 to 3·5 μ, bearing on ascending branches 5- to 11-septate macroconidia ranging from 52 to 90 by 15 to 22 μ (mostly 64 to 72 by 18 to 19 μ), tapering towards the apical and basal cells, ovoid to piriform, pleurogenous or acrogenous microconidia, 3·5 to 6 by 2 to 3·5 μ, sessile or on short sterigmata, relatively large nodular bodies, and numerous 'racquet' hyphae.

M. pseudosolanosum, obtained from a man's hand, forms pinkish-buff colonies and produces extensively branched conidiophores, 20 to 40 by 2 to 3·5 μ, 2- to 10-septate, slender, fusoid macroconidia, 46 to 80 by 12 to 22 μ (mostly 64 to 68 by 16 to 20 μ), piriform to elongate-ellipsoid, and usually sessile microconidia, 3 to 4 by 1·5 to 2 μ.

The colonies of *M. obesum*, also isolated from a boy's scalp, are cartridge-buff; the 4- to 11-septate, narrowly obovate macroconidia, bluntly rounded at the apex, tapering towards the base, borne on conidiophores measuring 10 to 40 by 2 to 2·5 μ, expanding upwards to 5 μ, range from 38 to 78 by 12 to 20 μ (mostly 48 to 56 by 16 to 18 μ), and the microconidia, which are sessile, or borne on slender sterigmata on short lateral branches, are 2 to 5 by 1·5 to 2·5 μ.

M. simiae, isolated from a monkey, forms a loose, white, cottony aerial mycelium concealing a light buff, powdery layer of 5- to 9-septate macroconidia, 48 to 76 by 14 to 20 μ (mostly 54 to 58 by 16 μ), tapering towards the apical and basal cells, borne on branched conidiophores, 30 to 40 by 2 to 3 μ, and microconidia measuring 4 to 6 by 1·5 μ borne on slender branches up to 10 μ in length.

Stevenin (G.). **Trois cas de microsporie humaine d'origine animale.** [Three cases of human microsporosis of animal origin.]—*Rec. Méd. vét.*, cxiii, 3, pp. 149–151, 1937.

An account is given of an outbreak of ringworm of the hands and neck among three students at the Alfort Veterinary College [Seine, France]. The agent of the disorder, *Microsporon felineum* [*R.A.M.*, xvii, p. 37], is believed to have originated in cultures of infected cat's hairs, in the study of which one of the students was engaged.

Rimbaud (P.). **L'utilisation de la lumière de Wood pour le diagnostic et la surveillance du traitement des teignes tondantes.** [The utilization of Wood's rays for the diagnosis and supervision of the treatment of scalp ringworms.]—*Gaz. Hôp., Paris*, cx, 48, pp. 780–781, 1937.

Excellent results are stated to have been obtained in France by the use of Wood's rays for the differential diagnosis of ringworms (*Microsporon* and *Trichophyton* spp.) and favus [*Achorion* spp.] of the juvenile scalp [*R.A.M.*, xv, p. 510]. Directions are given for the application of the method, and its extended use advocated.

Cummer (C. L.). **Tinea capitis with kerion in an adult caused by Trichophyton lacticolor.**—*Arch. Derm. Syph., Chicago*, xxxvi, 4, pp. 844–845, 1937.

Brief clinical details are given of a case of tinea capitis and kerion

in a 37-year-old man associated with a fungus which was isolated on Sabouraud's medium and identified by J. Gammel and Pollacci as *Trichophyton gypseum lacticolor* [*T. mentagrophytes*: *R.A.M.*, xii, p. 695].

Usher (B.) & Mitchell (D. S.). **Study of an epidemic of ringworm of the extremities in an orphans' home.**—*Canad. med. Ass. J.*, xxxvii, 1, pp. 60–62, 1937.

Clinical evidence of ringworm of the toes of the feet was revealed by the examination of all 65 children in a Montreal orphanage and positive cultures of *Trichophyton interdigitale* [*R.A.M.*, xvi, pp. 316, 810] were obtained from 21 (32 per cent.).

Kuske (H.). **Über allergische Allgemeinexantheme bei Favus.** [On allergic generalized exanthema in favus.]—*Derm. Z.*, lxxvi, 4, pp. 125–138, 4 figs., 1937.

A critical discussion, amplified by clinical observations, is given of ten cases (nine in one family) of favus (*Achorion schoenleini*) investigated during the period 1921–34 at the Berne University Clinic, in two of which extension in the form of generalized allergic exanthema (favid) was definitely proved, while in a third it was regarded as questionable.

Wagner (H. C.) & Rackemann (F. M.). **Kapok and molds: an important combination.**—*Ann. intern. Med.*, xi, 3, pp. 505–513, 1937.

Steam sterilization of vegetable (cotton and kapok [*Ceiba pentandra*]) or silk floss fibres changes the material in such a way as to preclude the active growth of moulds, e.g., *Aspergillus niger*, *Rhizopus nigricans*, and *Penicillium* and *Chaetomium* spp., involved in the causation of asthma [cf. *R.A.M.*, xvi, p. 675], which will, however, develop on boll cotton and bale kapok, especially when the fungi originate in samples of old kapok, cotton lint, or house dust. The skin-test active principle is directly proportional to mould growth and is thus much more marked in 120- than in 60-day cultures and when unsterilized material is inoculated.

Cavallero (C.). **Observations sur la biologie du 'champignon de muguet' [Mycotorula albicans (Robin) Langeron et Talice, 1932].** [Observations on the biology of the 'thrush' fungus (*Mycotorula albicans* [Robin] Langeron et Talice, 1932).—*Boll. Sez. ital. Soc. int. Microbiol.*, ix, 7, pp. 237–247; 8, pp. 257–259, 262–267, 1937.

The results of inoculation experiments on laboratory animals with twelve strains of *Mycotorula* [*Candida*] *albicans* [*R.A.M.*, xvii, p. 111] from various sources showed that some are devoid of all pathogenic influence, or at any rate incapable of adapting themselves to the living tissue, others are pathogenic to animals whatever their source and whether injurious or otherwise to man, while yet others are pathogenic both to man and animals. Inoculation with *C. albicans* induces in animals characteristic modifications in the blood serum discernible by complement deviation tests. The antibodies forming part of this reaction can be demonstrated in the serum of inoculated animals after

a month of illness and their numbers increase with each successive inoculation. The reaction is positive in respect both of the antigen prepared from the specific strain employed and of that derived from other strains of the same species but not of unrelated organisms. Proof was further obtained of cutaneous allergy in the animals inoculated with *C. albicans*, but this reaction was not strictly specific, being evoked in a modified form by antigens of other fungi. The reactions displayed by the animals immunized against *C. albicans* by vaccination (with the fungus killed by heat) or premunition (with the living organism) are considered to partake of the nature of hyper-receptivity rather than of allergy *sensu stricto*.

Turu (H.). **Beitrag zur Pathogenese der Faulecke (Perlèche).** [A contribution to the pathogenesis of perlèche.]—*Hihu-to-Hitunyo, Hukuoka*, v, pp. 406–412, 1937. [Japanese. Abs. in *Zbl. Haut- u. GeschlKr.*, lvii, 9, p. 694, 1938.]

From the middle of September, 1935, to the middle of February, 1937, the writer isolated yeast-like fungi from the corners of the mouth in 27 of the 60 patients (45 per cent.) suffering from 'perlèche' [*R.A.M.*, ix, p. 382]. The disorder may affect persons of any age, but is most prevalent during the twenties, infection being generally bilateral. The fungi are believed to play an etiological part in the condition.

Black (R. A.) & Fisher (C. Virginia). **Cryptococcic bronchopneumonia.**—*Amer. J. Dis. Child.*, liv, 1, pp. 81–88, 3 figs., 1 graph, 1937.

Full clinical details are presented of a case of bronchopneumonia in a ten-year-old boy yielding no laboratory evidence of pathogenic bacteria in the nasopharynx or sputum, cultures from which on Sabouraud's medium (subsequently transferred to 6 per cent. honey agar) gave rise, however, to full, round, creamy-tan colonies composed of oval budding forms, 2 to 3 by 1 to 2 μ. The organism, which is identified as *Cryptococcus glabratus* Anderson (*J. infect. Dis.*, xxi, p. 341, 1917), produced acid and gas from dextrose, levulose, and mannose but did not liquefy gelatine; it proved to be pathogenic to white rats in laboratory experiments. The systematic position of the genus is discussed in relation to recent taxonomic studies.

Croveri (P.) & Zeglio (P.). **Micosi broncopolmonare pura da Cryptococcus (Torulopsis) sp.** [Primary bronchopulmonary mycosis due to *Cryptococcus* (*Torulopsis*) sp.]—*Arch. Sci. med.*, lxiii, 5, pp. 351–378, 13 figs., 1937.

A comprehensive account is given of the writers' studies in connexion with a case of primary bronchopulmonary mycosis in a 29-year-old woman, the causal organism of which was identified as a species of *Cryptococcus* (or *Torulopsis*), characterized on acid carrot agar by a compact growth of creamy consistency and yellow coloration giving rise to round or oval, double-walled, granular, guttulate, budding cells, 5 to 10 by 4 to 6 μ. Further researches on the fungus are in progress.

JUNGHANNS (H.). **Eine seltene Hefepilzerkrankung der Haut mit Epithelwucherungen (Blastomykose, Gilchristsche Krankheit).** [A rare yeast fungus disease of the skin with epithelial excrescences (blastomycosis, Gilchrist's disease).]—*Virchows Arch.*, ccxcix, 4, pp. 767–774, 7 figs., 1937.

Full clinical details are given of a mild case of blastomycosis or Gilchrist's disease [*Endomyces dermatitidis: R.A.M.*, xvi, p. 384] in a 28-year-old woman. The occurrence of this condition is stated to be very exceptional in Germany.

CONANT (N. F.). **The occurrence of a human pathogenic fungus as a saprophyte in nature.**—*Mycologia*, xxix, 5, pp. 597–598, 1937.

From a careful study of the eight species of *Cadophora* [*R.A.M.*, ix, p. 77; xiv, pp. 274, 729] so far described, all occurring on lumber and pulp, and three strains of *Phialophora verrucosa* [ibid., xvi, p. 812] isolated from man the author concludes that these fungi belong to the same genus, the endogenous conidial formation, with ampullaceous conidiophores having funnel- or cup-like structures at the apices, being common to all. *Cadophora* must therefore become a synonym of *Phialophora*. *C. americana* [ibid., xiv, p. 274] is a synonym of *P. verrucosa*, and the following species of *Cadophora* [ibid., xvii, p. 84] are transferred: *P. fastigiata* (Lagerb. & Melin) Conant, *P. brunnescens* (Davidson) Conant, *P. lagerbergii* (Melin & Nannf.) Conant, *P. melinii* (Nannf.) Conant, *P. obscura* (Nannf.) Conant, *P. repens* (Davidson) Conant, and *P. richardsiae* (Nannf.) Conant. The occurrence of the human pathogen *P. verrucosa* on wood pulp and timber is of interest.

DELAMATER (E. D.). **Eidamella spinosa (Matruchot and Dassonville) refound.**—*Mycologia*, xxix, 5, pp. 572–582, 2 pl., 1 fig., 1937.

A fungus isolated from a finger-nail in Boston in 1935 has been identified as *Eidamella spinosa*. It produces perithecia in abundance in culture and the vegetative growth resembles that of many of the true dermatophytes. Thick-walled intercalary chlamydospores are formed in large numbers, and terminal chlamydospores are less regularly seen. On honey, maltose, and other agars a blood-red pigment is produced, but the mycelium is pure white, except that hyphae in contact with the substratum become coloured and at the inception of the perithecial stage it becomes speckled grey-black. The refinding of *E. spinosa*, the ascigerous stage of which is described, reopens the question of the position of the ringworm fungi in the Gymnoascaceae [*R.A.M.*, xi, p. 575] instead of in the Fungi Imperfecti. But the author is of opinion that there is as yet no justification for the reclassification of the dermatophytes among the Gymnoascaceae, as Langeron and Milochevitch, Nannizzi, and others have done, since such a step can only be based upon the finding of the sexual stage in an undoubted pathogen. In the present instance the writer was unable to produce typical ringworm lesions with his cultures, but infection is very difficult to secure with ringworm fungi and the fact that the fungus has been found twice in definitely pathological conditions is suggestive, though by no means final. The author does not agree with C. W. Dodge (Medical Mycology [p. 430]) [ibid., xv, p. 368] in regarding *E. spinosa* as a synonym of *Gymnoascus setosus*.

Oomen (H. A. P. C.). **Een schimmel (Cephalosporium spec.). als epiphyt op een niersteen.** [A fungus (*Cephalosporium* spec.) as epiphyte on a renal calculus.]—*Ned. Tijdschr. Geneesk.*, lxxxi (iii), 31, pp. 3659–3667, 1 pl., 1937. [German and English summaries.]

Full clinical details are given of a fatal case of mycotic infection of the kidney in a 44-year-old man associated with the presence on an oxalate renal calculus of the fungus previously referred to as *Acremonium potronii* Vuill. [*R.A.M.*, xv, p. 20] but here renamed *Cephalosporium potronii* (Vuill.) Oomen on the basis of a thorough systematic comparison of a number of specimens of both genera. On peptone malt agar the fungus forms dull pink, pulverulent, fluffy colonies, later turning yellow to dark brown with radial and tangential folds. The aspect of cultures on other malt media, including Sabouraud's proof agar, is similar. Microscopic examination reveals the presence of roughly flask-shaped conidiophores, 10 to 80 μ in length and 1 to 2·3 μ in diameter, bearing shiny heads, 10 to 33 μ in diameter, composed of numerous oval conidia, 4 to 5 by 2 to 2·3 μ. These fructifications are often replaced by irregular arthrospores and large, thin-walled, yellow chlamydospores among the yellowish-brown mycelium. This is believed to be the first record of a *Cephalosporium* in the internal organs.

Mattick (A. T. R.), Hiscox (E. R.), & Davis (J. G.). **Biennial reviews of the progress of dairy science. Section B. Bacteriology and mycology applied to dairying.**—*J. Dairy Res.*, viii, 3, pp. 369–405, 1937.

Among the many references of bacteriological and mycological interest in this review of two years' progress in dairy science [*R.A.M.*, xv, p. 154], besides Vernon's studies on butter defects, already noticed from other sources [ibid., xvi, p. 536], the following may be mentioned. Ause and Macy (*Amer. Cr. Poult. Prod. Rev.*, lxxix, p. 190, 1934) found no correlation between the numbers of *Oospora lactis* and the keeping quality of butter after storage [ibid., xv, p. 440], but this organism was found to be capable of destroying the flavour of fine starter butter. The same fungus was shown to be associated with the production of the typical flavour of Camembert cheese. A bibliography of 368 titles is appended.

Ciccarone (A.). **Su un attacco di 'Botrytis cinerea' Pers. a 'Hibiscus sabdariffa' Linn.** [Notes on an attack by *Botrytis cinerea* Pers. on *Hibiscus sabdariffa* Linn.]—*Riv. Pat. veg.*, xxvii, 9–10, pp. 265–274, 3 figs., 1937.

The author states that in November, 1936, *Hibiscus sabdariffa* plants in the Botanic Garden of Palermo, Sicily, were severely attacked by *Botrytis cinerea*, which caused diffuse, yellowish, later leaden-coloured spots on the leaves, resulting in the premature death and fall of the latter; it also killed the flower buds on affected plants, from which it spread to the branches and main stems, forming on these dark-coloured, depressed lesions; in severe cases the main stems were completely girdled by the fungus and collapsed. Isolations yielded a strain of *B. cinerea* which in further studies was shown to belong to the freely sporing

('conidial') group of the organism [*R.A.M.*, viii, p. 528]. Single spore subcultures were proved in inoculation tests to be highly pathogenic to *H. sabdariffa*, but not to the rose, cotton, potato, or tomato. In paired cultures no fusion was observed between the mycelium of the *Hibiscus* strain and that of a saprophytic strain isolated from rose fruits.

RÖDER (K.). **Phyllosticta cannabis (Kirchner?) Speg. eine Nebenfruchtform von Mycosphaerella cannabis (Winter) n.c.** [*Phyllosticta cannabis* (Kirchner?) Speg., an imperfect reproductive stage of *Mycosphaerella cannabis* (Winter) n.c.]—*Z. PflKrankh.*, xlvii, 10, pp. 526–531, 4 figs., 1937.

The stems of hemp plants from three different parts of Germany were found in the summer of 1936 to be infected by *Phyllosticta cannabis* [*R.A.M.*, xvi, p. 749], which is normally confined to the foliage. The material from two of the localities further bore large numbers of dark brown, applanate-spherical perithecia, 90 to 180 μ (average 135 μ) in diameter, rupturing the epidermis by means of a short papilla and occupied by up to 140 asci, 65 to 85 by 9 to 10 μ (75 by 9·5 μ), containing eight hyaline, bicellular spores, 11 to 17 by 4·5 to 8 μ (13·6 by 5·4 μ), which germinate in 14 to 24 hours at 24° C. The perithecia are scattered over the stem but the round or oval pycnidia, the former measuring 100 to 250 μ in diameter (average 175 μ) and the latter 150 to 225 by 90 to 120 μ (180 by 100 μ), are restricted to the discoloured (dark brown or black) tissues. The dimensions of the hyaline, elongated-oval, often slightly curved pycnospores in nature are 3 to 7 by 1·5 to 3·5 μ (5·1 by 2·3 μ); in culture they are a little larger. Germination is accomplished in 16 to 24 hours at 24°. Smooth, thick-walled, brown chlamydospores, elongated or round in nature, commonly the latter in culture, 8 to 17 μ in diameter (average 12 μ), develop in profusion in the vicinity of the pycnidia. Lupin stems and barley ears proved to be the most satisfactory media for perithecial development from single ascospore cultures; on Brown's starch, potato juice, and oatmeal agars, rice, elm wood, and potato stems, perithecia were less abundant but the typical pycnidia and chlamydospores of *P. cannabis* were formed. Both perithecia and pycnidia developed indifferently from the pycno- and ascospores obtained in pure culture, and monospore cultures of the chlamydospores and pycnospores occurring in nature each yielded pycnidia and chlamydospores but did not have the capacity of forming perithecia. Evidence is thus furnished of the genetic connexion between the perfect and imperfect stages of the hemp pathogen; the former should henceforth be known as *M. cannabis* (Winter) n. comb. (syn. *Sphaerella cannabis*). A Latin diagnosis of both stages is given.

ULBRICH (E.). **Ein neuer Fall von 'Alloiophyllie' bei Anemone nemorosa.** [A new case of 'alloiophylly' in *Anemone nemorosa*.]—*Verh. bot. Ver. Brandenburg*, lxxvii, pp. 86–89, 1 fig., 1937.

Attention is drawn to a fresh case of alloiophylly in *Anemone nemorosa* [*R.A.M.*, xvi, p. 130], the leathery consistency of the foliage being reminiscent of *Helleborus* leaves while the few flowers produced attained the size of peony blossoms. Both normal and diseased shoots may arise from the same rhizome. The presence of *Puccinia fusca* on

one of the affected plants is considered to be without etiological significance, and the same applies to the occasional association of *Urocystis anemones* [ibid., x, p. 600] with alloiophylly. The condition appears to occur indiscriminately on moist and dry soils, but it is noteworthy that all reports have so far emanated from woodland areas. This is the first record for the Mark Brandenburg.

Böhmig (F.). **Ueber die Anfälligkeit der Chrysanthemum-Sorten.** [On varietal susceptibility in Chrysanthemums.]—*Blumen- u. PflBau ver. Gartenwelt*, xli, 44, p. 510, 1937.

The summer of 1937 afforded a favourable opportunity for the observation of varietal reaction in chrysanthemums to three leaf diseases, rust [*Puccinia chrysanthemi*: *R.A.M.*, xvi, p. 465], mildew [*Oidium chrysanthemi*: loc. cit.], and *Septoria* [? *chrysanthemella*: loc. cit.]. Highly susceptible to rust and *Septoria* were Madame Bringuier, Ondine and its sport Zitron, Allpink, and Dühmke's white and yellow (early propagation only), while mildew was severe on American Beauty, Perle von Vierlanden, Golden Seal, Rose Chochod and its variant Edmonton White, and Bronze Enton [*sic*] Beauty (also for early propagation). The following were practically free from all three diseases: Printemps d'Amour, Monument, Roi d'Or, Le Centenaire, the Ashes, Herbstglut, Madeleine Morin, Baldock's Crimson and its sport Algore's Yellow, Sprite, Phoenix, and Catriona.

Tompkins (C. M.) & Tucker (C. M.). **Foot rot of China-Aster, annual Stock, and Transvaal Daisy caused by Phytophthora cryptogea.**—*J. agric. Res.*, lv, 8, pp. 563–574, 4 figs., 1937.

In addition to causing foot rot of China aster (*Callistephus chinensis*), *Phytophthora cryptogea* [*R.A.M.*, xv, p. 156] has also been found in California causing a similar disease of the annual stock (*Matthiola incana* var. *annua*) and Transvaal daisy (*Gerbera jamesonii* var. *transvaalensis*), characterized by a very sudden wilt of the infected plants. The soft, wet rot involves the roots and lower portions of the stems of the China aster and annual stock, and the roots and crown of the Transvaal daisy, and is rapidly lethal. Excessive moisture, poor soil drainage, and cool weather favour the development of the disease. The strains of *P. cryptogea* isolated from the three hosts were indistinguishable in pure culture, but in cross-inoculation experiments the isolate from the Transvaal daisy was pathogenic to the annual stock but not to China aster, that from the annual stock infected China aster and Transvaal daisy, and that from China aster was pathogenic to the other two species and also to cucumber seedlings and young plants of wallflower (*Cheiranthus cheiri*) and Michaelmas daisy (*Aster* spp.), as well as to unwounded fruits of eggplant, ripe tomato, green chillies (*Capsicum annuum* var. *grossum*), pumpkin, watermelon, and cucumber.

From a group of diseased Transvaal daisy plants at Burlingame, California, showing symptoms indistinguishable from those of *P. cryptogea*, pure cultures of *P. drechsleri* were consistently isolated which, when inoculated into healthy Transvaal daisies, reproduced the typical disease symptoms.

Creager (D. B.). **Phytophthora crown rot of Dogwood.**—*J. Arnold Arbor.*, xviii, 4, pp. 344–348, 1 pl., 1937.

The results of the author's investigation, started in 1934, of a serious crown rot of the flowering dogwood tree (*Cornus florida*) planted on lawns and in gardens in Long Island showed that it is caused by *Phytophthora cactorum*. The disease, which usually leads to the disfiguration and ultimately to the death of the tree, is characterized by a severe die-back of the crown associated with defoliation; the leaves are few, small, and chlorotic and the affected trees usually bear an abnormal abundance of fruit several years before being killed. The seat of the disease is a necrotic lesion at the crown, at first quite obscure but gradually, as the lesion increases, the bark ruptures and the sap oozes in form of slime-flux. The bark over the older areas dies and is shed, and internally the diseased tissues are markedly discoloured, the affected area revealed on the removal of the bark having the shape of a parabola with a characteristically zonate surface. These zonations mark the different periods of the growth of the pathogen, and the lesion involves the greater part of the crown before the tree eventually dies.

P. cactorum was consistently isolated from the lesions of affected crowns. Pathogenicity was determined by inoculation tests made on seedlings in the greenhouse, the inoculum being inserted through an incision at the soil surface. At the end of seven weeks 16 of the 25 plants inoculated were dead whereas all the control plants remained healthy. Inoculation tests on larger trees in the field gave similar results.

Fron (G.). **L'emploi en horticulture des sels de quinoléine.** [The use of quinoline salts in horticulture.]—*Rev. hort., Paris*, cix, 22, pp. 647–649, 1 fig., 1937.

The use of cryptonol (ortho-oxyquinoline sulphate) [see above, p. 166] for the control of carnation wilt (*Fusarium dianthi*) is now standardized in France [*R.A.M.*, xv, p. 584] as follows. The cuttings are immersed for 12 to 24 hours in a 1 in 25,000 solution of the fungicide, and after planting out are regularly watered, together with the surrounding soil, with a 1 in 10,000 solution. On transference to the greenhouse (after the removal of any diseased individuals) the plants are again sprayed with cryptonol (1 in 25,000). The preparation has also given excellent results in an obscure disorder of vine grafts involving a heavy reduction of germination.

Fritz (F.). **Beiträge zur Pathologie der Zellmembran.** [Contributions to cell membrane pathology.]—*Z. PflKrankh.*, xlvii, 10, pp. 532–541, 9 figs., 1937.

Part I of this paper deals with the partial or total resorption of the membranous lamella enveloping the lumen of dead epidermal cells of *Tradescantia purpusi* by the adjoining living cells. In part II the author describes the recent detection, in fern prothalli in pure culture on fragments of peat or 2 per cent. agar, of a fungus presenting close analogies with *Completaria complens* Lohde, observed by W. Leitgeb over fifty years ago under similar conditions (*S.B. Akad. Wiss. Wien*, Abt. I,

lxxxiv, p. 288, 1882). At the sites of infection the penetrating hyphae are enveloped by the host cell in a cellulose substance, so that tubes or short 'fingers' arise connecting the opposite cell walls. These abnormal structures accumulate large quantities of vagin.

Schultz (H.). **Vergleichende Untersuchungen zur Ökologie, Morphologie und Systematik des 'Vermehrungspilzes'.** [Comparative studies on the ecology, morphology, and systematic position of the 'propagation fungus'.]—*Arb. biol. Anst.* (*Reichsanst.*) *Berl.*, xxii, 1, pp. 1–41, 20 figs., 1937.

This is an exhaustive, fully tabulated account of the writer's studies on the ecological, morphological, and taxonomic relations of a number of strains of the so-called 'propagation fungus' (usually referred to *Moniliopsis aderholdi*), which is prevalent in German horticultural establishments [*R.A.M.*, xvi, p. 677]. The results of soil inoculation experiments in the greenhouse (mean temperature 20° C., atmospheric humidity 70 to 100 per cent.) on cuttings showed that the fungus produces different symptoms according to the nature of the host. *Hydrangea hortensis*, for instance, nearly always reacts by a damp stem rot involving rapid collapse, as also for instance do *Coleus blumei*, *Salvia splendens*, and Gloire de Lorraine begonias. In the case of *Santolina chamaecyparissus* and *Chrysanthemum indicum* the stem base usually remains free from infection, which sets in higher up. In *Campanula isophylla* and *Pilea nummularifolia* the fungus commonly starts from the foliage. In similar tests on seedlings yellow lupins (*Lupinus luteus*) were severely attacked by a number of strains of the propagation fungus, whereas comparative trials with some strains of *Rhizoctonia* [*Corticium*] *solani* K. from potato [ibid., ix, p. 739] mostly resulted in little or no damage. Both Neger and Wachs Flageolet beans (*Phaseolus vulgaris*) were much more resistant to the propagation fungus than lupins.

Of the various crucifers tested (white and red cabbage, kohlrabi, radish, and wallflower) only the first-named (Late Brunswick) showed appreciable resistance. Among the most virulent strains of the organism were those originating on crucifers, which caused complete destruction of the embryo. Lettuce (Maikönig) proved highly resistant and Danish Export tomatoes relatively so on the whole. Tests on Odenwälder Blaue potatoes showed that both the propagation fungus and *C. solani* K. are equally pathogenic, so that Wellensiek's proposal to maintain the name *M. aderholdi* as distinct from *C. solani* on the grounds of differential pathogenicity to tomato and potato [ibid., v, p. 193] cannot be upheld. As in the case of cabbage, strains originating on potato exhibited a marked degree of pathogenicity towards the same host. In a series of tests designed to ascertain the correctness or otherwise of the common view that susceptibility to the propagation fungus declines with increasing age, only lettuce proved to be an exception to the rule, older plants being distinctly more susceptible than young ones.

Most of the strains under investigation fell into five groups according to their mode of forming hyphal anastomoses. Such fusions are freely formed between individuals of the same group but not between those of others. In general, members of the same fusion group also agree in respect of morphological characters and temperature relations. Apart

from the predilection of certain strains of the propagation fungus for a given host, as indicated above, biologic specialization *sensu stricto* cannot be said to exist within this plurivorous organism, which is probably widely distributed over the entire globe. It is further apparent from the results of these studies that *M. aderholdi* is merely a variety of *C. solani* and as such is no longer entitled to rank as an independent entity [ibid., xv, p. 586]. In the case of two of the five groups the perfect (*Hypochnus*) [*Corticium*] stage of the fungus developed, in the shape of hymenium, basidia, and basidiospores, in inoculation experiments on a number of hosts. The spore dimensions for three of the strains (from kohlrabi, lettuce, and chrysanthemum) were 10·21 by 5·71, 8·99 by 5·42, and 8·92 by 5·19 μ, respectively. On the basis of these results, the groups are designated as follows: I. *R. solani* K. var. *hortensis* n.var.; II. *H. solani* P. and D. var. *brassicae* n.var.; III. *H. solani* P. and D. var. *typica* n.var. ('potato group'); IV. *R. solani* K. var. *cichorii endiviae* Thomas [ibid., iv, p. 443]; and V. *R. solani* K. var. *fuchsiae* n.var.

Ludwig (M.). **Lupinenwelke und ihre Bekämpfung.** [Lupin wilt and its control.]—*Dtsch. landw. Pr.*, lxiv, 41, p. 500, 1937.

The writer briefly summarizes the results of experiments in combating a form of lupin wilt due to *Fusarium vasinfectum* [cf. ibid., xvi, p. 539 and the next abstract] by (*a*) an intensified potash-phosphate and lime fertilizing schedule and (*b*) seed treatment with uspulun. Neither of these measures was successful in eliminating the trouble, which was confined to yellow lupins [*Lupinus luteus*] in the Zerbst [Anhalt] district.

Richter (H.). **Blatt-, Stengel- und Hülsenflecken an Lupinen.** [Leaf, stem, and pod spots on Lupins.]—*NachrBl. dtsch. PflSchDienst*, xvii, 10, pp. 77–80, 9 figs., 1937.

During 1937 sweet blue lupins (*Lupinus angustifolius*), chiefly in Mecklenburg and Pomerania, were severely attacked by a hitherto unknown disease, characterized by premature shedding (in the second half of July) of the leaves, which were found on examination to bear numerous circular to oval, bluish-grey to greyish-brown spots, from a pin's head to 4 mm. in diameter, sometimes surrounded by a narrow pale or yellowish-green marginal zone. The lesions may converge and assume irregular forms. Infection spreads from the older to the younger foliage. Only the pinnate leaves are involved at first, the petioles mostly remaining attached in a desiccated condition to the plants until the latter finally collapse. At an advanced stage of the disease, circular to oval, sometimes very slightly sunken, reddish-brown, gradually darkening, at first sharply delimited, later confluent spots, up to 5 by 3 mm., appear on the stems and pods. On the death of the plants the root system rapidly decays and is colonized by fungi, especially *Fusarium* spp., which may cause confusion with foot rot. The younger stem portions are more or less crooked and extraordinarily brittle, while the pods are described as 'breaking like glass'; they contain only a few undeveloped seeds, if any. In one affected stand visited by the writer the weight of a thousand seeds was only 118·25 gm. as compared with the normal average of 191.

Bitter lupins were occasionally observed to be affected by the disease, blue lupins are definitely prone to attack, but neither the white (*L. albus*) nor the yellow (*L. luteus*) has so far shown any sign of infection. *Macrosporium* [*Thyrospora*] *sarcinaeforme* [*R.A.M.*, xvi, p. 616] was consistently isolated from the tissues of the diseased leaf areas, but seldom developed in cultures from the stems or pods; a preliminary inoculation experiment with this fungus on *L. angustifolius* gave positive results.

Brown spot disease (*Ceratophorum setosum*) [ibid., xiii, p. 166; xvi, p. 636], though previously observed in Germany, occurred for the first time in a virulent form on white lupins, causing the formation on the pods of extremely irregular, chestnut- to dark chocolate-brown, flat, slightly protuberant, or depressed and concentrically zonate lesions, 1 to 3 cm. in diameter, sharply delimited or merging by means of a light brown margin into the healthy tissue. On old plants in a damp atmosphere the typical conidia develop in the form of coal-black strata on the affected areas. In the case of late infection the spots are confined to the pods and the seeds remain healthy, but where the pathogen gains early ingress it passes to the seeds, causing brown spotting, and may readily be isolated from them. On the foliage the lesions also vary in size, shape, and colour; affected leaves are prematurely shed but on the whole the course of the disease is slower and its effects less harmful than in the case of *T. sarcinaeforme*. Needle-prick inoculations, however, resulted within three days in the development of lesions 1 cm. in diameter on green *L. albus* pods, while *L. mutabilis* also contracted infection fairly rapidly. The pathogen produced much milder effects on blue and yellow lupins and beans (*Phaseolus vulgaris*) but apple fruits developed brown, necrotic areas, 1 cm. in diameter, 13 days after inoculation. *L. mutabilis* and some other New World types also showed flower infection in the shape of brownish, necrotic spots on the petals which did not, however, appear to cause any actual damage. The following species were attacked at the Dahlem Biological Institute: *L. mutabilis*, *L. cruckshanksii*, *L. elegans*, *L. hartwegii*, *L. pulcherrimus*, *L. ornatus*, *L. micranthus*, *L. pubescens*, *L. albifrons*, *L. arboreus*, and *L. polyphyllus*; in contrast to *L. albus*, in which the pods are the most susceptible organs, these types showed almost exclusively foliar infection. *C. setosum* was also reported during 1937 from Neumark, Landsberg-an-der-Warthe, Havelland [Brandenburg], and East Prussia.

RUDORF (W.). **Untersuchungen zur Züchtung von kleekrebsresistenten Kleearten und Luzerne. Ausarbeitung von Infektionsmethoden. Vorläufige Mitteilung.** [Investigations on the breeding of Clover species and Lucerne resistant to Clover stem rot. Elaboration of infection methods. Preliminary communication.]—*Züchter*, ix, 10, pp. 249–253, 12 figs., 1937.

In studies at the Kaiser Wilhelm Plant Breeding Institute in Müncheberg, Mark Brandenburg, the author found that the best method for obtaining a large amount of inoculum of *Sclerotinia trifoliorum* [*R.A.M.*, xvii, p. 114] for clover inoculation experiments is to culture the fungus on small bread rolls, soaked in plum juice or clover leaf decoction; masses of sclerotia are produced and the rolls are then dried and ground to a

powder which is sprayed in a suspension on the leaves of the test plants. Another method is to inoculate ripe tomato fruits with the fungus and to use the pulp, which becomes permeated with mycelium, after dilution, as a spray on the test plants. Clover plants are stated to be easily infected with conidia of *S. trifoliorum* [no macroconidial stage of this fungus has yet been reported] obtained in considerable quantities from clover leaves inoculated with the fungus and kept in Petri dishes in the presence of moist blotting paper. Conidia are also stated to be profusely formed in old cultures on dextrose peptone agar. So far resistance tests on seedlings in a saturated atmosphere have indicated the presence of resistant individuals, which withstood three consecutive inoculations, in the Lembkes, Fränkischer, Schleswig, Dregers Böhmische zweischürige, Merkur, Ultuna, and Tystofte No. 40 clovers.

Braid (K. W.) & Tervet (I. W.). **Certain botanical aspects of the dying-out of Heather (Calluna vulgaris, Hull.)**—*Scot. J. Agric.*, xx, 4, pp. 365–372, 2 figs., 1937.

A fungus with black, horsehair-like rhizomorphs found to be associated with the dying-off of heather in Scotland was shown by comparative studies to bear a close resemblance to *Marasmius equicrinis* [*R.A.M.*, xvi, p. 798], both organisms being characterized by a thick-walled, spiral 'cortex' and a large, thin-walled 'medulla', while an affinity with *M. androsaceus* (a specimen of which from heather is included among Crossland's Yorkshire fungi) is also indicated. Other fungi occurring on heather in Scotland are *Dasyscypha nivea* (prevalent on dead and dying heather but so far there is no proof that it is actively parasitic), *Armillaria mellea* [ibid., vii, p. 29; viii, p. 147], and *Corticium* sp.

The black hairs of the rhizomorph fungus, up to 3 in. long, arise from hyphal agglomerations at the leaf bases and leaf scars, or (under relatively dry conditions) from the basal stems. The larger rhizomorphs produce rectangular branches 1 in. or more in length. The results of inoculation experiments with the rhizomorph fungus on wounded and unwounded plants yielded no evidence of primary parasitism, but the widespread distribution of the organism on dying and dead heather suggests some etiological connexion with the disease. Low temperature alone does not cause the typical fox-red discoloration associated with dying-off, but may be of importance in combination with strong wind, sunshine, beetle (*Lochmaea suturalis*) infestation, and possibly fungal invasion.

Plant diseases. Notes contributed by the Biological Branch.—*Agric. Gaz. N.S.W.*, xlviii, 10, pp. 573–577, 6 figs., 1937.

These notes contain, *inter alia*, a brief account of brown patchiness of lawns, which is stated to have been troublesome in several districts of New South Wales in 1937. The condition, which may appear in small spots, but more usually extends into larger areas of irregular shape, and leads to the browning and death of the grass leaves, is caused by *Rhizoctonia* [*Corticium*] *solani* [*R.A.M.*, xvi, p. 681] and *Curvularia spicata*, to which all turf-forming grasses and more particularly bent grass (*Agrostis tenuis*) are susceptible. It can be controlled by watering the

affected areas with a solution of a mixture of 1·5 oz. each of mercuric and mercurous chloride in 50 galls. water, a volume sufficient for the treatment of 1,000 sq. ft.

Wollenweber (H. W.) & Hochapfel (H.). **Beiträge zur Kenntnis parasitärer und saprophytischer Pilze. IV. Coniothyrium and seine Beziehung zur Fruchtfäule.** [Contributions to the knowledge of parasitic and saprophytic fungi. IV. *Coniothyrium* and its relationship to fruit-rotting.]—*Z. Parasitenk.*, ix, 5, pp. 600–637, 3 figs., 1937.

In a brief introduction to this, the fourth instalment of this series [*R.A.M.*, xvi, p. 323], the authors state that they investigated the relationship of 12 species of *Coniothyrium* to fruit rots only because of the fact that representatives of this genus, which mostly includes only leaf parasites, have been recorded in literature on stored fruits, chiefly apples imported from America. In a detailed discussion of the taxonomy of the genus *Coniothyrium*, they state that the most reliable morphological characters are the size and shape of the spores which in the great majority of cases always remain unicellular, and only very occasionally may in some species develop a transverse septum, e.g., at germination. The slight variations observed in the shape and size of the conidiophores are not considered to be of systematic significance, any more than the differences in the size, shape, and constitution of the pycnidia. A very full taxonomic and morphological account with Latin diagnoses is then given of the 12 species studied including *C. platani*, *C. ulmeum*, *C. fuckelii* [*Leptosphaeria coniothyrium*], *C. concentricum*, *C. tirolense*, and *C. pusillum* Wr. n. sp., which was found occasionally attacking the leaves of *Primula veris*. With the possible exception of *C. tirolense*, isolated in Berlin from imported apples and from dead twigs of *Juglans mandschurica* growing in the Botanic Garden, Dahlem, which caused a fairly rapid rot of apples and tomatoes, none of the other species tested proved to be an aggressive pathogen to these two species of fruits.

Atkinson (J. D.). **Wound dressings for fruit-trees.**—*N.Z. J. Sci. Tech.*, xix, 5, pp. 313–316, 3 figs., 1937.

Recent observations having shown that the vertical-retort coal tar at present available on the New Zealand market does not afford adequate protection against the entry of pathogens through wounds on fruit trees (e.g., *Stereum purpureum* on peach), a series of experiments was carried out in the Hastings district in 1935 on Sturmer and Dougherty apple trees to determine the comparative value as wound dressings of coal tar, creosote, bitumistic paint 'colasmix' (a proprietary bitumen emulsion derived from crude petroleum containing 55 per cent. bitumen, 2 per cent. of a casein type emulsifier, and less than 0·2 per cent. injurious water-soluble potassium salts), white lead paint (Brooks's formula: 2 lb. white lead paste, 1 fluid oz. turpentine, 1 fluid oz. raw linseed oil, and ¼ oz. cobalt drier), and Chavostelon's formula (equal parts of 6 per cent. aqueous solutions of copper sulphate and potassium bichromate). Of these materials only 'colasmix' gave completely satisfactory results; nearly 1½ years after application callus formation was proceeding rapidly and the wounds showed no sign of damage from the

dressing. Most of the white lead had flaked away, but the treated wounds had formed a moderate amount of callus.

Hus (P.). **De economie van de bespuitingen in de fruitteelt.** [The economics of spraying in fruit culture.]—*Tijdschr. PlZiekt.*, xliii, 10, pp. 227–237, 1937.

The writer discusses the economic aspects of five important problems connected with spraying against diseases and pests in Dutch orchards, viz., how often and at what intervals to apply the treatments, what disinfectants to use, the best spraying apparatus, the advisability or otherwise of incorporating 'wetters' with plant-protectives (the use of which is strongly recommended), and the advantages and drawbacks of the co-operative system as opposed to independent action on the part of individual growers.

Wenzl (H.). **Eine neue Blattfleckenkrankheit auf Apfel, Doucin und Paradies in Österreich (Entomosporium maculatum Lév.).** [A new leaf spot of Doucin and Paradise Apples in Austria (*Entomosporium maculatum* Lév.).]—*Neuheiten PflSch.*, xxx, 5, pp. 199–202, 1937.

The prevalent leaf spot of free quince and pear stocks caused by *Entomosporium maculatum* (*Stigmatea mespili*) [*Fabraea maculata*: *R.A.M.*, xv, pp. 103, 427; xvi, p. 327] has recently been observed to have spread to several apple varieties, including Doucin and Paradise stocks, this being a new record for Austria. The fungus is further spreading extensively from quince to pear in Lower Austrian nurseries. Most of the conidia both from quince and pear are uniseptate, with occasional non- and triseptate individuals, and local observations lend no support to Laubert's theory of biologic specialization within the species [ibid., iii, p. 216].

Borzini (G.). **Sul comportamento di alcune varietà di Peri inoculate con lo 'Stereum purpureum' Pers.** [On the behaviour of some Pear varieties inoculated with *Stereum purpureum* Pers.]—*Boll. Staz. Pat. veg. Roma*, xvii, 2, pp. 201–205, 2 figs., 1937.

In continuation of his studies on silver leaf disease (*Stereum purpureum*) [*R.A.M.*, xvi, p. 543] of pears the author states that the results of inoculation tests with the fungus on different varieties demonstrated that the Passa Crassana variety is the most susceptible, being killed within seven or eight months. Beurré Diel showed some symptoms of infection but the disease did not develop, whereas Beurré Clairgeau and Abate Fêtel were completely resistant. The attention of growers is directed to the necessity of testing experimentally the susceptibility of new varieties before planting them on damp soils likely to induce infection with *S. purpureum*.

Van der Plank (J. E.) & Davies (R.). **Temperature—cold injury curves of fruit.**—*J. Pomol.*, xv, 3, pp. 226–247, 14 graphs, 1937.

This is stated to be an interim report, pending the publication of fuller accounts, of the general conclusions arrived at by the authors in their work at the Low Temperature Research Laboratory, Capetown,

on the interrelation of temperature and physiological breakdown of various fruits in cold storage, with particular reference to breakdown of plums, woolliness of peaches, and pitting of Marsh grapefruit [cf. *R.A.M.*, xvi, p. 807 *et passim*]. Within the range of the temperatures tested (30° to 55° F.) it was found that the most extensive amount of injury during relatively short periods of storage (25 days) occurred at the intermediate temperatures, with a falling-off at the higher or lower temperatures, so that usually the injury temperature curves show a peak. Two opposing factors appeared to be responsible for this peak, namely, (1) an equilibrium factor, expressed by lowering of the temperature increasing the disposition of the fruit towards injury, and (2) a kinetic factor, expressed by rising temperatures accelerating the manifestation of injury, indicating a process governed by the thermochemical rule that the rate of change is reduced as temperature is lowered. The temperature of maximum injury is essentially labile, and may occur above or below the freezing point of the fruit; it is not, however a fixed characteristic of the latter. For Marsh grapefruit a gradation was shown from a peaked to an incomplete curve without a demonstrable peak. The temperature of maximum injury was further shown to be lowered by (*a*) greater resistance of the fruit, (*b*) long period of storage, and (*c*) a faster rate of manifestation of injury.

When the period of storage was lengthened, the number of fruits injured did not increase indefinitely, but attained a 'maximum' which was sufficiently definite to be considered as a first approximation. The number injured was largest when the maximum was reached at the lowest temperatures, but the maximum was attained soonest at the highest temperature. This suggests that when a sample of fruit is stored at a constant temperature, a portion of the sample, depending on the susceptibility of the fruit, is out of equilibrium from the very instant of cooling (primary susceptibility), and subsequently develops injury, while the remainder is in a state of healthy equilibrium, as far as cold injury processes are concerned, and continues in this state indefinitely. While at present no known method exists of following the course of the chemical processes resulting from disequilibrium with the storage temperature, which eventually produce visible symptoms, the temperature coefficient (Q_{10}) of these processes may be determined for a given sample from the time taken by it to reach maximum injury. Frequency distribution curves of the 'primary susceptibility' of a population of fruit over a range of storage temperatures can be prepared, and it is shown that the efficacy of any measure calculated to reduce primary susceptibility may be measured in terms of shifting the frequency distribution curves of susceptibility down the temperature axis. In certain cases, however, a 'secondary susceptibility' can develop in fruit owing to changes that occur in it during storage, but injury due to primary and secondary susceptibility can be allocated separately. Various fruits may sustain only the one or the other, or both together. The factors predisposing fruit to secondary susceptibility do not appear to be directly related to those causing primary susceptibility. In conclusion the simple scheme of analysis suggested is applied to the data of Kidd and West on cold injury of apples [ibid., xiv, p. 41] to illustrate the amount of information which may be secured by this means.

Zeller (S. M.). **Two Septoria leaf-spot diseases of Rubus in the United States.**—*Phytopathology*, xxvii, 10, pp. 1000–1005, 2 figs., 1937.

A comparative study of the imperfect stages of the fungi associated with *Rubus* leaf spots in various parts of the United States and in England has necessitated a critical revision of the taxonomic position of two organisms liable to confusion in nature, viz., *Septoria rubi* West. var. *brevispora* Sacc., which is renamed *S. brevispora* (Sacc.) Zeller, and *S. rubi* West. *S. brevispora* produces angular, zonate spots, 1 to 2 mm. in width, cinnamon-brown near the margin, light pinkish-cinnamon within, turning light brownish-grey, usually not encircled by a purplish- or reddish-brown zone merging into the healthy tissue, as in the case of *S. rubi*. The fungus is characterized by brownish, broadly ostiolate pycnidia (5 to 18, average 10·4 per lesion), 46 to 60 μ in width, 27 to 35 μ in height, producing from the base only cylindrical, hyaline, uni- to triseptate spores, 15 to 30 (or up to 36) by 1·8 to 3·4 μ. The brownish-red, later whitish, purple-bordered spots formed by *S. rubi* are 0·5 to 1·5 mm. in width and bear only 1 to 7 (average 2·2) brownish-black, oblate-depressed, thin-walled, summer pycnidia, 80 to 100 μ in width, 75 to 85 μ in height, with a fairly narrow, somewhat rostrate ostiole, and produce both basally and laterally filiform uni- to pluriseptate, hyaline spores, 20 to 55 by 1·5 to 2·5 μ. The winter pycnidia of this species are characterized by heavy, dark walls, 3 to 4 cells thick, and an ostiole with no rostrate tendency. *S. rubi* predominates in Oregon and elsewhere along the Pacific Coast and *S. brevispora* in Maryland, Wisconsin, New York, and North Carolina. Generally speaking, raspberries and *R. strigosus* are highly susceptible to *S. brevispora* and resistant to *S. rubi*, while blackberries are subject to infection by both.

The question of the perfect stage of *S. rubi* presents considerable difficulty. *Mycosphaerella rubi* [ibid., xv, p. 163] was described by Roark from specimens collected in Door County, Wisconsin, and nothing resembling it has been observed in Oregon. On the other hand, *M. ligea* is prevalent in Oregon on green overwintering or fallen leaves of Himalaya, Logan, and Evergreen (*R. laciniatus*) blackberries where the European type of *S. rubi* occurs, suggesting a genetic connexion which has not, however, been confirmed by cultural experiments. The perfect stage of *S. brevispora* has not been observed by the writer.

Stahel (G.). **Notes on Cercospora leaf spot of Bananas (Cercospora musae).**—*Trop. Agriculture, Trin.*, xiv, 9, pp. 257–264, 8 pl., 1937.

This is a full report of the author's investigations of the leaf spot of bananas (*Cercospora musae*) in Surinam, a preliminary summary of which has already been noticed [*R.A.M.*, xvi, p. 545]. In addition to the information previously given, it is stated to have been shown by cultural experiments on portions of leaf tissue that the spermogonia present on dry leaf spots belong to the life-cycle of *C. musae*. These bodies, which on the average measure about 50 μ in diameter (but may attain 90 μ), originate in the substomatal air chambers and open immediately under the stomatal pores. The spermatia, which were never observed germinating, measure 3·5 to 4 by 0·8 μ, and are formed in long, straight chains. Of the two kinds of perithecia constantly found on the

spots, the most common is that of a species of *Leptosphaeria*, which is believed to be probably identical with *L. musarum* [ibid., xv, p. 487]. Pure culture studies showed that this fungus is genetically identical with the species of *Hendersonia*, previously reported, the pycnidia of which are also constantly present on the banana leaf spots, but not with *C. musae*. The other kind of perithecia belongs to a species of *Mycosphaerella*, quite distinct from *M. musae* [ibid., viii, p. 25]; it is considered to be new to science, and is named *M. minima* [without a Latin diagnosis]. In pure culture its mycelium is hyaline at first, but later turns brown; it grows slowly and in twisted fashion, and no conclusion could be reached in regard to its genetic relationship to *C. musae*, which for the most part exhibits markedly stronger but somewhat similar growth. Spraying experiments carried out by the Surinam Banana Company during $2\frac{1}{2}$ years show that the cost of one application is $1·75 per acre. The motor sprayer is mounted on a boat which is easily moved to all parts of the empoldered plantations. Bayer fungicide with an adhesive is now used in place of Bordeaux mixture as it involves less labour.

[A Dutch version of this paper is published as *Bull. Dep. Landb. Suriname*, 53, 27 pp., 1937.]

WARDLAW (C. W.). **Banana diseases. XI. Notes on some plantation diseases in Guadeloupe.**—*Trop. Agriculture, Trin.*, xiv, 10, pp. 279–280, 1937.

The author states that in the Island of Guadeloupe (French Antilles) the main commercial banana is the Congo or Poyo, a mutant of the Cavendish group, with an occasional admixture of Gros Michel, Dwarf Cavendish, and other varieties. The diseases observed in the Congo variety include bacterial wilt (*Bacterium solanacearum*) [*R.A.M.*, xvi, p. 393], black tip (*Helminthosporium torulosum*) [ibid., xvi, p. 156], and leaf-spotting (*Cercospora musae*) [see preceding abstract]; leaf speckle (*Chloridium musae*) [ibid., xvi, p. 476] and a leaf spot caused by *Cordana* [*Scolecotrichum*] *musae* [ibid., xv, p. 705] were present but neither is of much importance. In one localized hillside area, planted with the Congo variety (possibly derived from one source), a complex form of disease was observed, comprising both virus markings on the leaves of a type similar to that already seen in Trinidad, Bermuda, and Brazil [ibid., xiii, p. 251], and an extensive type of heart rot of the youngest unrolled leaf and of the inner tissues of the pseudostem, which may progress downwards until the compact tissue of the rhizome is reached, at which point a sharp line of demarcation separates the healthy and the diseased tissues. The condition presents a striking similarity with the Australian infectious chlorosis [loc. cit.], and may eventually be proved to be identical with it. Destruction of infected stools *in situ* is advised. Panama disease (*Fusarium oxysporum cubense*) was found on the Gros Michel banana, but as this variety is not favoured on French markets the disease is not considered locally to be of economic importance.

GONÇALVES (R. D.). **Saporema.**—*Biologico*, iii, 10, pp. 302–305, 2 pl., 1937.

The author states that along the southern littoral of Brazil the name

'saporema' (vernacular for 'stinking root') is commonly applied to a root rot of bananas associated with species of *Rosellinia* and *Fusarium*, to a root rot of cassava associated with *Rosellinia* sp. [*R.A.M.*, xv, p. 278], which is at present under investigation, and also to peculiar sclerotial formations, the weight of which ranges from 3·5 to 28 kg., frequently found in banana and cassava plantations. Pieces of such bodies kept in moist, dark chambers, produced in two instances, after 15 and 5 months' incubation, respectively, sporophores apparently identical with those which were obtained in 1897 by Möller in Berlin-Dahlem from saporemas received from Brazil, and which he described under the name *Polyporus sapurema*. Experiments still in progress, in which fragments of the sclerotia were either introduced in, or left in direct contact with wounded banana pseudostems, have so far given no indication that the fungus is pathogenic to this host. The Australian fungus (*Laccocephalum basilapidoides*) described by McAlpine and Tipper in 1894 presents many points in common with the Brazilian organism.

THOMPSON (A.). **Pineapple fruit rots in Malaya. A preliminary report on fruit rots of the Singapore canning Pineapple.**—*Malay. agric. J.*, xxv, 10, pp. 407–420, 20 pl., 1937.

This is a full account of the author's studies of the three diseases of pineapple fruits in Malaya, namely fruitlet brown rot, broken core, and fruit collapse, associated with various bacteria and fungi. In addition to information already given [*R.A.M.*, xvi, p. 657] it is stated that the fruitlet brown rot is apparently similar to the disease recorded in the Philippines and Haiti [ibid., xiv, p. 456] and is also associated with an organism resembling *Erwinia ananas* [loc. cit.], often with another closely resembling *Phytomonas* [*Pseudomonas*] *ananas* [loc. cit.], and with a species of *Penicillium*.

Fruitlet brown rot appears to be more frequent in riper fruit and can be seen after removal of the outer layers of the fruit. It is characterized at an early stage by the brown discoloration of the top or of one or all the three placental lobes and though the rot is sometimes extensive it does not usually progress beyond the base of one or more of the ovarial loculi. It is often possible to cut out the diseased tissues and use the rest of the fruit for canning purposes. Preliminary inoculations with the associated organisms through wounds of half-grown fruits, or immature fruits which had finished flowering, gave negative results. However, in fruit inoculated when mature or in the flowering stage with the yellow *E. ananas* brown rot developed in 8 out of 36 cases and when *Penicillium* was used in 3 out of 12 cases. The author considers that development of the rot in the fruits inoculated when in flower might be the result of natural infection and further evidence is required to establish this mode of infection. Inoculations with three strains of white bacteria (one closely resembling *Pseudomonas ananas*) gave positive results in five cases, but the organisms could not be reisolated. The author concludes that the frequent isolation of *E. ananas* and *Penicillium* from diseased fruits and the results of the inoculation experiments recorded alone indicate that these organisms are implicated in

the development of the disease, but that their parasitic nature is doubtful, the rotting being influenced by certain internal and external factors which set up conditions favourable to the organisms concerned. Spraying is considered impracticable as a control measure, and more promising methods are the breeding of resistant strains and possibly the use of potash as fertilizer.

Broken core is of frequent occurrence in Malaya but has not been recorded elsewhere. It is characterized by ripening of the fruit from the top downwards, and often there may be a depression at the centre or a bending of the top to one side. It is sometimes accompanied by a saprophytic rot, which attacks the core or the tissues next to the core and renders the fruit unfit for canning. The cause of the disease has not yet been determined.

Fruit collapse appears to be confined to Johore where it was observed in 1935 affecting 2 per cent. of the fruit brought to the canning factories. Isolations from the diseased tissues yielded two species of bacteria, yeasts, and a species of *Fusarium*, but none has reproduced the disease on inoculation.

GREEN (E. L.) & GOLDSWORTHY (M. C.). **The copper content of residues from sprays containing adjuvants.**—*Phytopathology*, xxvii, 10, pp. 957–970, 1937.

In 1935 four, and in 1936 five spray mixtures with a copper phosphate [*R.A.M.*, xvi, pp. 391, 549] basis were applied to test blocks of Kieffer pears at the Beltsville (Maryland) Horticultural Field Station. All contained 2 lb. copper phosphate, 4 lb. hydrated lime, 2 lb. bentonite, and water to make 50 galls. One mixture contained no further ingredients, while the following adjuvants were incorporated with the others: (2) 4 oz. 'butylated diphenyl sulphonic acid'; (3) ⅔ lb. of a synthetic resinous material blended with sodium oleyl sulphate [ibid., xvii, p. 123]; (4) 1 lb. of a special fish-oil soap; and (5) 1 qt. cottonseed oil per 100 galls. Samples of fixed areas of all the plots were taken at intervals from May to October and analysed for total copper content.

In 1935 the quantity of copper per unit area was not affected by any of the accessory substances within the fairly wide error of sampling, but in the drier season of 1936 all the adjuvants increased the initial deposit of copper, and at least two [from table 2 apparently fish-oil soap and cottonseed oil] measurably enhanced adhesion. Inconclusive data were obtained in regard to the control of leaf blight (*Fabraea maculata*) [see above, p. 188], against which the treatments were applied.

TRAPPMANN (W.). **Zur Kennzeichnung der Pflanzenschutzmittel.** [On the designation of plant-protectives.]—*Kranke Pflanze*, xiv, 10, pp. 165–169, 1937.

This is an appeal to German manufacturers of plant protectives for more frankness and accuracy in the designation of their preparations, the present haphazard system of describing which may lead to serious misconceptions as to the properties and uses of such substances.

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Saint-Charles (R. de). **Bouillies adhérentes et mouillantes.** [Adhesive and wetting spray mixtures.]—*Rev. Vitic., Paris,* lxxxvii, 2256, pp. 227–229, 1937.

The author states that in his practical experience sulphonated terpenic alcohols [*R.A.M.*, xv, p. 819] gave full satisfaction in increasing the adhesive and wetting properties of the fungicidal and insecticidal sprays used for the control of vine diseases and pests, at concentrations of from 100 to 200 gm. per 100 l. spray. For fruit trees the strength should be somewhat increased, the actual amount being determined empirically by dipping a leaf of the species to be treated in the prepared mixture. He states further that when mixed with copper salts these alcohols have been experimentally proved in 1936 and 1937 to be effective against vine *Oidium* [*Uncinula necator*].

Quantz (J. J.). **Verbessertes Verfahren zur Dämpfung kleiner Erdmengen mit Futterdämpfern.** [An improved method of steaming small quantities of soil with fodder-steamers.]—*Blumen- u. PflBau ver. Gartenwelt,* xli, 41, pp. 475–476, 1 fig., 1 diag., 1937.

Details are given of an improved procedure based on Storck's method of sterilizing small quantities of soil by steam [*R.A.M.*, xii, p. 460], using a tip-cart holding 80 l of soil fitted with a specially constructed fork (Kyffhäuserhütte, Maschinenfabrik, Artern, Saxony) and attached to the Nema fodder-steamer 120. The steam, generated in the latter, permeates the soil in the cart (connected by means of a tube) through openings in the prongs of the fork, and the necessary soil temperature of 95° C. should be reached in 25 minutes. It is estimated that 1·5 cu. m. of soil can be treated daily by this process.

V^e^ Congrès international technique et chimique des industries agricoles Schéveningue—1937. Comptes-rendus Volume I. Section 5. Maladies et parasites des plantes industrielles. Question 4. Maladies des plantes. Défense contre ces maladies. Influence des éléments secondaires sur la production et l'état sanitaire des plantes industrielles. [Fifth International Technical and Chemical Congress of Agricultural Industries Scheveningen—1937. Proceedings Volume I. Section 5. Diseases and parasites of economic plants. Problem 4. Plant diseases. Protection against these diseases. Influence of minor elements on the production and state of health of economic plants.]—pp. 410–450, 457–488, 501–507, 5 figs., 7 graphs, 1937.

In a brief opening survey of the problems under consideration J. Dufrénoy outlines the principles of plant protection.

H. M. Quanjer sums up the position in regard to the alleged extension and aggravation of plant diseases by cultivation.

N. van Poeteren discusses the question of the need for chemical treatments against plant diseases and pests in course of extension, and concludes that such direct measures (as opposed to indirect control by breeding for resistance and the provision of optimal environmental conditions) are indispensable.

L. Roger draws attention to the need for the application of phytosanitary measures to tropical crops, such as coffee, cacao, *Hevea* rubber, cotton, and sugar-cane, the varieties of which under cultivation are

commonly selected for productivity rather than for an inherently robust constitution.

J. Dufrénoy briefly summarizes some outstanding recent studies on beet, sugar-cane, and cotton diseases, and gives an account of elements indispensable to healthy plant growth.

Experiments showing the relation of magnesium to the health of beets are described by G. Roland [*R.A.M.*, xvi, p. 649].

J. Baeyens gives a concise survey of the uses of the chief 'minor' or 'secondary' soil elements in agricultural plant physiology, in connexion with which the relegation of these important minerals to accessory rank is deprecated as illogical. Some suggestive general conclusions are drawn as to the characterization and physiological role of the 'rare' elements and the importance of an exact analytical and experimental technique in their investigation.

F. Lambermont describes the results of experiments in the control of beet leaf spot (*Cercospora beticola*) in Spain with Bordeaux mixture, copper oxychloride, and Burgundy mixture [ibid., xii, p. 416], of which the last-named in particular gave highly satisfactory results, augmenting the yield in certain cases by over 1 ton per hect.

Otero (J. I.) & Cook (M. T.). **A bibliography of mycology and phytopathology of Central and South America, Mexico and the West Indies.**—*J. Agric. P. R.*, xxi, 3, pp. 249–486, 1937.

This is a briefly annotated list, arranged alphabetically under the authors' names, of papers relating to the mycology and phytopathology of Central and South America, Mexico, and the West Indies.

Galloway (L. D.). **Paints and mould growth: causes and remedies described.**—*Paint Varn. Lacq. Manuf.*, vii, 10, pp. 317–318, 1937.

Among the moulds commonly found on paint [*R.A.M.*, xvi, p. 826] are dark-pigmented species of *Cladosporium*, including *C. herbarum*, *Phoma pigmentivora*, the agent of reddish-purple stains [ibid., xvi, p. 398], various green species of *Penicillium*, and under very damp conditions *Aspergillus* spp., such as *A. niger* and *A. flavus*, the latter being commonly reported from breweries. Factors conducive to paint mildew are a high relative humidity of the atmosphere (above 70 to 75 per cent.), an optimum temperature for fungal growth (25° to 30° C.), and the availability of nutrients, such as gelatine in glue, or casein emulsion, on water paints, and linseed in oil paints. A degree of control may therefore be exercised by the avoidance of these conditions, but in practice the most popular method of combating mildew is the use of an efficient antiseptic, among the more promising of which may be mentioned thymol, mercuric chloride (both 0·02 per cent.), *p*-chlor-*m*-cresol (0·05), sodium silicofluoride (0·15), salicylanilide (shirlan), *o*-chlormercuriphenol (0·01), and borax (1). Magnesium silicofluoride has been found useful for washing down plaster walls in damp situations where mildew is very liable to occur.

T. MacLachlan has recently shown that fungi are largely responsible for the blackening and decay of stone in large cities, where the relative scarcity of sunlight prevents rapid drying after rain and affords little opportunity for the beneficial action of ultra-violet rays.

KLEMM (M.). **Pflanzenschutzmeldedienst und Erzeugungsschlacht.** [Plant protection information service and production campaign.] *NachrBl. dtsch. PflSchDienst*, xvii, 9, pp. 69–70, 1937.

In order to co-operate effectively in the campaign for the intensification of agricultural production in Germany, the author advocates widening the scope of the plant protection information service considerably.

KÖGL (F.) & FRIES (N.). **Über den Einfluss von Biotin, Aneurin und Meso-Inosit auf das Wachstum verschiedener Pilzarten. 26. Mitteilung über pflanzliche Wachstumsstoffe.** [On the influence of biotin, aneurin, and meso-inositol on the growth of various species of fungi. Note 26 on plant growth substances.]—*Hoppe-Seyl. Z.*, ccxlix, 2–4, pp. 93–110, 2 graphs, 1937.

Certain Phycomycetes, Ascomycetes (e.g., *Nematospora gossypii* [*R.A.M.*, xvi, p. 199], *Lophodermium pinastri* [ibid, xvi, p. 847], *Nectria coccinea* [ibid, xvi, p. 645], and *Sclerotinia cinerea*), and Basidiomycetes (*Polyporus adustus* [ibid., xvi, p. 354] and *P.* [*Polystictus*] *abietinus* [ibid., xvi, p. 7]) were induced to grow or stimulated to exceptionally profuse development by the addition to a synthetic medium [the composition of which is indicated] of one or more of the growth substances biotin (the purified active principle of bios), meso-inositol, and aneurin. The growth of *Nematospora gossypii*, for instance, was augmented by the admixture of meso-inositol with or without aneurin at a dilution of $1:25\times10^{-10}$, the optimum concentration, however, being $1:25\times10^{-8}$. The results of further experiments denoted that certain fungi failing to respond to one or other of the above-mentioned substances produce sufficient quantities thereof to meet their own requirements. When *P. adustus* and *N. gossypii* were grown together on the synthetic medium, both were able to develop, the former apparently supplying biotin and the latter aneurin.

WALKER (J. C.), MORELL (S.), & FOSTER (H. H.). **Toxicity of mustard oils and related sulfur compounds to certain fungi.**—*Amer. J. Bot.*, xxiv, 8, pp. 536–541, 2 figs., 1937.

The toxicity of twelve [listed] volatile organic sulphur compounds to *Colletotrichum circinans*, *Botrytis allii*, *Aspergillus niger*, *A. alliaceus*, and *Gibberella saubinetii* has been studied, in view of the possible relation of these substances to disease resistance [*R.A.M.*, xiv, p. 553], by exposing the fungus in question to the vapour phase of the volatile oil in a closed chamber, and also to the volatile oils in solution. The oils were found to differ widely in their effect on a given fungus, and among the five fungi studied there was a wide range of sensitivity to a given sulphur oil. The type of radical attached to the nucleus of the organic molecule exerted an effect on the toxicity, in general the descending order of toxicity being allyl, phenyl, methyl, and ethyl. Isomeric substances may vary considerably as shown by the high toxicity of methyl isothiocyanate and the relatively low toxicity of methyl thiocyanate. Of the fungi studied *G. saubinetii* was the most sensitive, followed in order by *C. circinans* and *B. allii*, *A. alliaceus*, and *A. niger*. Allyl mustard oil showed extreme toxicity in the free state, but when present as the glucoside, sinigrin, the form it usually takes in plant

tissues, it manifests no toxicity. This substance may be expected to function in host resistance only when it is released as the free oil, and conclusions regarding the protective value of a toxic substance such as this based on gross chemical analyses may therefore be quite misleading.

Ovčarov [Ovtcharoff] (K. E.). **The production of thio-urea by fungi.**—*C.R. Acad. Sci. U.R.S.S.*, N.S., xvi, 9, pp. 461–464, 1937.

As a result of chemical analyses by a method which is described, the author states that thio-urea was experimentally shown to be produced in pure culture by certain fungi (*Fusarium* sp. of the *Gibbosum* section, *Verticillium albo-atrum*, and *Botrytis cinerea*) in the presence of asparagin and ammonium salts, but not of nitrates. Traces of thio-urea were also found in healthy *Rubus saxatilis*, *Alchemilla vulgaris*, and *Rhamnus cathartica* plants, while in plants of the same species infected with their respective rusts [unspecified] the amount of thio-urea was considerable, suggesting the secretion of this substance by the parasite into the host tissues. Further experiments indicated that an accumulation of thio-urea in the tissues of the higher plants leads to a lowering of their photosynthetic energy and to a yellowing and necrosis of the green leaves, though chlorophyll did not seem to be affected directly.

Baldacci (E.). **Nuove ricerche sulla 'vaccinazione' delle piante.** [Further studies on the 'vaccination' of plants.]—Reprinted from *Atti Ist. bot. Univ. Pavia*, Ser. IV, x, 19 pp., 1937. [Latin and English summaries.]

Continuing his studies on plant 'vaccination' [*R.A.M.*, xv, p. 678; xvii, p. 55], the writer describes a series of experiments, yielding only inconclusive or negative results, on the immunization by this method of wheat and rice seedlings against *Helminthosporium sativum* and *H. oryzae* [*Ophiobolus miyabeanus*: ibid., xvi, p. 405; xvii, p. 61], respectively.

Schultz (E. S.). **Pathological phases of Potato wart disease.**—*J. econ. Ent.*, xxx, 5, pp. 721–723, 1937.

This is a concise summary of the available information on wart disease of potatoes (*Synchytrium endobioticum*), reference to the various aspects of which herein discussed has been made from time to time in this *Review*.

Sch. **Umstellung des Kartoffelbaues auf krebsfeste Sorten bis zum Jahre 1941.** [The reorganization of Potato cultivation with wart-immune varieties by the year 1941.]—*Dtsch. landw. Pr.*, lxiv, 43, pp. 525–526, 1937.

A brief outline is given of the rapid development of potato wart [*Synchytrium endobioticum*] in Germany [see next abstract] since its detection some 30 years ago, and of the attempts to combat the disease by the cultivation of immune varieties. By the Potato Wart Control Order of 8th October, 1937, the exclusive cultivation of officially recognized wart-immune varieties for seed is prescribed as from 1st March, 1941 [*R.A.M.*, xvi, p. 631], but during the interim certain susceptible varieties may be grown at the discretion of the administrative bodies

concerned [see below, p. 208], except on infected areas, where only immune sorts will be allowed. In order to facilitate the production of wart-immune planting stock for 1940–1, only potatoes of this category are to be placed on the market from 1st July, 1940, onwards.

Böhm (F.). **Der Weg einer Kartoffelzucht.** [The development of a Potato-breeding establishment.]—*Mitt. Landw., Berl.*, lii, 41, pp. 859–860, 2 figs., 1937.

An interesting account is given of the aims and activities of the potato-breeding establishment founded at Gross-Bieberau (Hesse) in 1900, with special reference to the development of varieties immune from wart (*Synchytrium endobioticum*: *R.A.M.*, xvi, p. 403], e.g., Ackersegen, Ovalgelbe, Mittelfrühe, Edelgard, and Sieglinde. An important feature of the work consists in the combination of the essential characters of productivity and immunity from wart disease with such desirable qualities as resistance to scab [*Actinomyces scabies*] and 'Eisenfleckigkeit' [ibid., xvi, p. 58]. The enterprise necessitates the annual testing of many thousand strains of various age groups, and those selected undergo extensive trials for wart reaction, productivity, and starch yield before being submitted to the Reich Food Board for further protracted testing.

Mammen. **Wichtige Knollenkrankheiten der Kartoffeln.** [Important diseases of Potato tubers.]—*Mitt. Landw., Berl.*, lii, 41, pp. 861–862, 1937.

With a view to increasing the German potato output, which is stated to amount to only 30 per cent. of the total world production, the writer gives a popular account of the symptoms, etiology, and control of some important diseases affecting the tubers, namely, scab [*Actinomyces scabies*], wart [*Synchytrium endobioticum*], and *Rhizoctonia* [*Corticium*] *solani*, followed by brief notes on the storage rots due to *Phytophthora infestans*, *Fusarium* sp., and bacterial agents.

Afanasiev (M. M.). **Comparative physiology of Actinomyces in relation to Potato scab.**—*Res. Bull. Neb. agric. Exp. Sta.* 92, 63 pp., 1937.

In this study on the physiology of parasitic and saprophytic species of *Actinomyces* [*R.A.M.*, xvii, p. 132] the author used 25 different cultures, 13 isolated from scabby potatoes in Nebraska (of which seven were parasitic), and 12 saprophytic strains obtained from different sources in the United States and abroad. Tests of cultures A–1, A–12, *A. clavifer*, *A. setonii*, 3369 (*A. viridis*), *A. tricolor*, and *A. xanthostroma*, reported by other workers to be parasitic, failed to show any pathogenicity. The seven parasitic strains produced scab of three types, viz., common, deep, and russet, and two or three of these types were often found on individual potatoes, the differences exhibited being due more to the degree of pathogenicity than of type, contrary to Millard and Burr's view [ibid., vi, p. 179]. Fickle midge larvae (*Sciara inconstans*), by feeding on the dead tissues of deep scab lesions, were observed to make them appear larger, but *A. scabies* is also capable of producing deep scab without the assistance of these or other larvae.

A tabulated account is given of experiments which were carried out

under comparable conditions on the ability of species of *Actinomyces* to utilize different carbon compounds; the results of tests of the parasitic and saprophytic species on different sources of carbon showed that the two groups are affected in the same way with the exception that all parasitic cultures are able to use sucrose and raffinose, whereas the saprophytes are unable to grow on them. On different nitrogen media growth of both parasitic and saprophytic species was similar except that practically all parasitic and some saprophytic strains failed to grow on media containing 0·5 per cent. of urea, due to the toxicity of ammonia formed as a product of the decomposition of urea. Further tests demonstrated that ammonium carbonate, ammonium bicarbonate, and ammonium hydroxide were also toxic because of the evolution of ammonia. Inhibition of growth caused by potassium bicarbonate and calcium hydroxide was greater in parasitic than in saprophytic species of *Actinomyces*, and the author believes that the growth failure of the parasitic cultures was due to the direct toxicity of these compounds rather than to their high alkalinity. The application of urea to sterilized soil previous to inoculation with parasitic *Actinomyces* reduces potato scab in proportion to the amount applied, and completely prevents scab when used at the rate of 0·5 gm. per 7 lb. soil. A pronounced difference in the effect on the development of aerial mycelium of parasitic and saprophytic cultures was found to be due to different carbon: nitrogen ratios, a high proportion of nitrogen inhibiting the production of aerial mycelium by the parasites but not by the saprophytic strains. All the parasitic and some of the saprophytic *Actinomyces* were able to produce melanin pigment on a tyrosine medium provided that other nitrogenous compounds were present. The ability of parasitic strains to utilize sucrose and raffinose, and to produce melanin pigment in a tyrosine medium, as well as their inhibition by ammonia, are important factors in differentiating them from many saprophytic species and may contribute towards finding some method for their control.

Goss (R. W.). **The influence of various soil factors upon Potato scab caused by Actinomyces scabies.**—*Res. Bull. Neb. agric. Exp. Sta.* 93, 40 pp., 1 fig., 1937.

In these studies on the effect of soil moisture, temperature, aeration, and soil microflora upon the occurrence of potato scab (*Actinomyces scabies*) [see preceding abstract] under partially controlled conditions in the greenhouse, emphasis was laid on the influence of these factors upon the development of *A. scabies* in the soil preceding the infection period. The severity of potato scab was found to be directly dependent upon the amount of inoculum in the soil, the latter being in turn dependent on the degree of competition of other soil organisms. The most severe infection took place when the soil was sterilized before inoculation, but this effect could be counteracted by the addition of filtrates from unsterilized soil or of organic matter in the form of manure, and by delaying inoculation until after saprophytic organisms had become established in the soil. No decrease in the severity of scab was observed when *A. praecox* was added to the soil in amounts approximately equal to that of *A. scabies* [cf. *R.A.M.*, vi, p. 684]. Sterilized soils, inoculated

with *A. scabies* and incubated at temperatures below 22° C., gave rise to less scab development than those incubated at 22° to 30°, whereas unsterilized soils did not show this effect.

The effect of soil moisture on the disease was variable, and although most scab occurred in dry soils, no effective control was indicated in a number of experiments with soils held at or near saturation point. The results of experiments on soil types indicated that caution should be exercised in comparing the effect of soil moisture in different soils; the largest amount of scab occurred in soils held at medium or high moisture contents for some months previous to planting, but no evidence was obtained that high soil moisture exerted any depressing effect upon the subsequent development of scab. No consistent relationship of numbers of *Actinomyces* to scab or to soil moisture was revealed in plate counts and soil slides; generally speaking, *Actinomyces* predominated in the drier soils, but the numbers were sometimes greatest in soils of high moisture content. An essential factor in the development of the disease was found to be soil aeration, and lack of it during the period preceding tuber formation produced a greater effect on the decrease of scab than deficient aeration during the period of infection.

Salaman (R. N.). **Potato variety production: a new departure.**—*Gdnrs' Chron.*, cii, 2653, pp. 326–327, 1937.

The two most important qualities to be aimed at by British potato-breeders are stated by the writer in this interesting sketch of the history of varietal production in England from 1600 onwards to be resistance to (1) blight (*Phytophthora infestans*) and (2) virus diseases. During the last ten years a number of seedling varieties have been developed combining blight resistance in both haulm and tuber with other desirable characters, the perpetuation of which, however, was complicated by the appearance in the Cambridge trial field of a new biotype or strain of the fungus attacking the resistant strains, though about a month later than the common domestic sorts, such as King Edward and Majestic. Resistance to this second form of blight, coupled with suitable commercial qualities, has gradually been built up, first by crossing the highly resistant *Solanum demissum* from Ecuador with the first line of resistant stocks and then back-crossing with domestic varieties such as Sutton's Abundance and Katahdin. New parental types are therefore now available for the further production of blight-resistant potatoes of a superior grade.

The resistance to the X virus claimed by American workers for their newly-developed variety [S] 41956 [*R.A.M.*, xvi, p. 630] has been confirmed in England, but on the whole the prospects of securing genetic resistance (as distinct from tolerance) to virus diseases are not encouraging. Further discussion of this problem is reserved for a future communication.

Lutman (B. F.). **Disinfectants and cut-seed Potatoes.**—*Bull. Vt agric. Exp. Sta.* 418, 36 pp., 4 pl., 13 figs., 1937. [Abs. in *Exp. Sta. Rec.*, lxxvii, 6, pp. 799–800, 1937.]

Five years' experimental work at the Vermont Agricultural Experiment Station demonstrated that formaldehyde is more injurious to cut

potato seed pieces than mercuric chloride, mercurous chloride, yellow mercuric oxide, or the organic mercury compounds, not merely penetrating the exposed parenchyma, but also progressing along the vascular bundles into the sprouts. Mercuric chloride solutions killed the seed pieces by coagulating the protoplasm, progress into the flesh increasing with the length of time the seed piece is kept; immediate removal of the coagulated layer reduces the penetration, which, if not removed, may kill the sprouts on planted seed pieces. Seed pieces disinfected with mercurous chloride generally germinate well, very little of the chemical being absorbed. The behaviour of yellow oxide of mercury [*R.A.M.*, xvi, p. 57] is similar. Cut seed pieces treated with organic mercury compounds are undamaged if dried immediately and completely. Cut tubers that are to be treated should be left in a damp, cool place for at least five days in order to regenerate a new skin, and should then be dipped in mercurous oxide, yellow oxide of mercury, or an organic mercury compound, preferably the last-named, and be promptly and thoroughly dried.

Singh (B. N.) & Mathur (P. B.). **Negative correlation between the occurrence of polyphenol oxidase and diastase and the degree of incidence of 'blackheart' of Potato.**—*Phytopathology*, xxvii, 10, pp. 992–1000, 1937.

A negative correlation was detected in the writers' studies at the Benares (India) Institute of Agricultural Research between the enzymic activity of potato tubers and the incidence of 'black heart' [*R.A.M.*, xi, pp. 126, 357], decreasing percentage contents of polyphenol oxidase and diastatic activities being associated with increasing degrees of disease incidence. At a temperature of 21° C. only 0·2 per cent. of the tubers showed symptoms of the disease but the percentage increased with an increase in the storage temperature, reaching 19·4 per cent. at 56°. The disorder would appear to be due to the partial destruction of the enzymes caused by the heating of the potatoes during summer storage, when the respiration of the tubers raises the temperature in the basket by some 5° C. above that prevailing in the storage room. At the same time carbon dioxide accumulates and a corresponding depletion of oxygen takes place in the surrounding air.

Tullis (E. C.). **Cercospora oryzae on Rice in the United States.**—*Phytopathology*, xxvii, 10, pp. 1005–1008, 1 fig., 1937.

Of recent years *Cercospora oryzae* has been observed in great profusion on rice sheaths, leaves, peduncles, and glumes in Arkansas, Alabama, Louisiana [*R.A.M.*, xvi, p. 708], and Texas, causing a reduction in the effective foliar area of the plants but no other appreciable damage. The fungus produces narrower and lighter brown lesions than those due to *Helminthosporium oryzae* [*Ophiobolus miyabeanus*] or *Piricularia oryzae*. Among the 58 varieties and hybrids resistant to *C. oryzae* in two year's tests were Nira, Tokalon, and C.I. Nos. 461, 2711, 2738, 4603, and 4966; possibly they may be further developed to replace the commercially grown Blue Rose, Edith, Lady Wright, and Early Prolific, which are very susceptible. The pathogenicity of the fungus was established by inoculations on several varieties and hybrid selections

and its subsequent recovery from the lesions thus induced. *C. oryzae* appears to enter the leaves through the stomata and settle in the substomatal epidermal cells. The conidiophores are produced from substomatal hyphal branches. The mycelium is mostly intracellular.

VOLLEMA (J. S.). **Wortelschimmels bij Rubber en Thee.** [Root fungi of Rubber and Tea.]—*Bergcultures*, xi, 43, pp. 1518–1530, 6 figs., 1937.

An account is given of the occurrence of the red root fungus (*Ganoderma pseudoferreum*) [*R.A.M.*, xvi, p. 798] in Javanese *Hevea* rubber and tea plantations, and of promising experiments in the application to tea of Bobilioff's method of combating the disease in rubber by exposure of the roots [ibid., viii, p. 523]. Notes are also given on *Fomes lignosus* in rubber plantations [ibid., xvi, 798] and on *Rosellinia arcuata* [ibid., xvi, p. 635] and *Armillaria fuscipes* [see above, p. 162] in tea gardens, and their control.

BERTRAND (H. W. R.) & MINOR (E. C. K.). **A method of controlling Fomes and other root diseases in replanted Rubber areas.**—*Trop. Agriculturist*, lxxxix, 3, pp. 135–140, 1937.

The authors state that the three dangerous root diseases of *Hevea* rubber in Ceylon, caused by *Fomes lignosus*, *F. noxius* [*R.A.M.*, xvii, p. 62] and *Poria hypobrunnea* [ibid., viii, p. 267], are far more common in replanted areas than was previously suspected. While fully agreeing with the desirability, stressed by Sharples in his recent book [ibid., xvi, p. 60], of promptly removing all 'knots' of infection from the soil before the roots of young rubber plants have begun to interlace, they consider that the complete removal of all infected material, especially on steep or boulder land, would not be always economically possible or agriculturally advisable. Instead of the present practice of planting thick stands, to allow for losses from root diseases, they suggest the use of a mixture of indicator plants, namely, *Crotalaria anagyroides*, *Tephrosia vogelii*, and *Boga medeloa*, which should be sown together after the removal of grass and all climbing covers from the soil. *C. anagyroides* is very susceptible to attack by *Sclerotium rolfsii* and pink disease [*Corticium salmonicolor*], and *T. vogelii* and *B. medeloa* by *Irpex subvinosus*, but if the seed of the three species is well mixed before sowing, the danger of these parasites killing large patches of the plants will be minimized. The necessity is emphasized of training the plantation staffs to recognize and treat the 'top' diseases of the 'indicator' bushes, which during the first two years from sowing may be profitably controlled by burning affected parts of diseased bushes and spraying the stems of the neighbouring plants with Bordeaux or Burgundy mixture. Prompt spotting of all the indicator bushes attacked by the root diseases is essential; the site in the field of such bushes is marked by a small red flag, and later all infected material is carefully removed and immediately burnt in a portable incinerator. In a number of cases attacked rubber 'buds' are stated to have been saved by wiping off the mycelium and applying 2 per cent. copper sulphate; this method is, however, only effective if the bark is not already killed.

BEARD (F. H.). **Observations on the incidence of downy mildew on new seedling varieties of Hops at East Malling, 1924–36.**—*J. Pomol.*, xv, 3, pp. 205–225, 1 graph, 1937.

In this paper the author gives a summarized account of the observations made from 1924 to 1936, inclusive, on the incidence of the hop downy mildew (*Pseudoperonospora humuli*) [*R.A.M.*, xvi, p. 835] on a wide range of new hybrid seedling varieties of hops and on strains of Fuggle, grown at the East Malling Research Station. The results show that while the intensity and the form of the disease (mainly spike production and cone infection) were largely influenced by the spring and summer rainfall, the relative susceptibility of the various seedlings remained fairly constant. Records of the incidence of the disease on seedlings of various parentages showed that seedlings of certain crosses have on the whole a high percentage of hills bearing spikes, whereas certain hybrid seedlings obtained with *Humulus americanus* and its variety *neo-mexicanus* as female parents, proved to be very susceptible to attack on the cones. Practically all the seedlings which showed severe rootstock infection were derived from the same American variety (Oregon Cluster), indicating a very close correlation between parentage and susceptibility to the disease. Only two of these seedlings, viz., Quality Hop 0063 and Fill-pocket (Z 62), have so far shown any marked resistance, and are included in a list of six new seedlings of various parentages which may be recommended for commercial cultivation. Of these additional four, Early Promise [loc. cit.] is stated to be definitely resistant to cone infection, and the New Mexican hybrid, Cats-Tail (OZ 79), has shown itself less susceptible to attack than another heavy cropping variety of the same parentage. At East Malling Fuggle was highly resistant, but there was evidence that various strains of this variety are in cultivation.

It is finally stated that routine spraying with Bordeaux mixture was largely effective in preventing attacks of the downy mildew on the cones.

JENKINS (ANNA E.). **New species of Sphaceloma on Aralia and Mentha.**—*J. Wash. Acad. Sci.*, xxvii, 10, pp. 412–414, 1 pl., 1937.

English and Latin diagnoses are given of two of the new species of *Sphaceloma*, namely, *S. araliae*, causing stem and leaf scab of *Aralia spinosa* in Maryland, and *S. menthae*, responsible for the so-called 'leopard spot disease' of the foliage, stems, and rootstocks of cultivated peppermint (*Mentha piperata*) in Indiana. The latter fungus is characterized by erumpent, superficial, hemispherical or flattened acervuli, 15 to 80 μ or more in diameter, a compact palisade of pale yellow conidiophores, 10 to 25 μ in thickness, and spherical to elliptical, hyaline conidia, 3 to 8 by 2·5 to 4 μ. The aspect of the thallus on potato dextrose agar is suggestive of *Myriangium*, the colour gradually turning from Varley's brown surrounded by Hay's maroon to pallid or light brownish-drab, while a pale yellowish-olive tint is imparted to the medium. The lesions produced by *S. menthae* are raisin-black, the central part becoming pallid to pale vinaceous-drab, circular to irregular or elliptical, up to 3 to 5 mm. in diameter.

Rands (R. D.) & Abbott (E. V.). **Root rot disease of C.P. 28/19.**—*Sug. Bull., New Orleans*, xv, 19, pp. 3–6, 1937. [Abs in *Facts ab. Sug.*, xxxii, 12, p. 483, 1937.]

The very unsatisfactory condition of autumn-planted C[anal] P[oint] 28/19 sugar-cane on heavy Louisiana soils in the spring of 1937, expressed by wilting, stunting, and deterioration of stand, was diagnosed as primarily due to *Pythium* root rot [chiefly *P. arrhenomanes: R.A.M.*, xvi, p. 206], favoured by abnormally high early winter temperatures followed by alternate wet and dry periods. On the other hand, the summer (August) plantings of the same variety were in excellent form, a fact pointing to the advisability of earlier planting on the heavier types of soil under local conditions.

Zundel (G. L.). **Miscellaneous notes on the Ustilaginales.**—*Mycologia*, xxix, 5, pp. 583–591, 1 pl., 1937.

Among the fungi discussed in these notes are the following: *Ustilago hitchcockiana* n.sp., collected on *Cynodon dactylon* in Kenya, forms linear sori, 2 to 7 cm. long, entirely destroying and deforming the inflorescence, with globose to subglobose, smooth spores, light olivaceous (dark brown in the mass) and 3·5 to 5·5 (rarely 7) μ in diameter. *Sphacelotheca kenyae* n.sp. is described on a species of *Hyparrhenia* from Kenya, *Sorosporium ischaemoides* (P. Henn.) n.comb. on a species of *Andropogon* from the Congo is the new name for *Ustilago ischaemoides*, *S. panici* var. *kinshasaensis* on *Panicum kinshasaënse* from the Congo is raised to specific rank as *S. kinshasaensis* (Beeli) nom. nov. and a redescription of *S. wildemanianum* is given from correctly named material on *Andropogon gayanus*. Latin diagnoses are given of the new species.

Poeverlein (H.). **Die Verbreitung der süddeutschen Uredineen.** [The distribution of the south German Uredineae.]—*Ber. bayer. bot. Ges.*, xxii, pp. 86–120, 1937.

Following some observations on certain idiosyncrasies in host-parasite interrelationships, as reflected in the erratic distribution of the south German Uredineae, the writer furnishes two extensive lists, one comprising those rusts which have hitherto only been detected sporadically in the regions visited notwithstanding the prevalence of their hosts, and the other enumerating members of the same group absent from south Germany although their hosts are present.

Dominik (T.). **Grzyby pasorzytnicze zebrane w okolicy Włocławka w sierpniu 1934 roku.** [Parasitic fungi collected in the neighbourhood of Włocławek in August, 1934.]—*Acta Soc. Bot. Polon.*, xii, 2, pp. 201–205, 1935. [French summary. Received 1937.]

This is a very briefly annotated list of 60 species of parasitic fungi, arranged in their systematic order, which were collected in 1934 on plants of economic or ornamental value in the neighbourhood of Włocławek, near Warsaw.

GADD (C. H.). **A leaf-fall disease of Grevilleas.**—*Tea Quart.*, x, pp. 156–159, 1937.

An account is given of a leaf-fall disease of *Grevillea* [*robusta*] trees in Ceylon prevalent mainly in districts below 1,000 ft. and occurring up to 1,600 ft. It is characterized by premature defoliation chiefly of the young leaves, but older ones may be shed also. Freshly fallen leaves appear healthy except for one or more spots irregular in size and shape, the young leaves being shrivelled, curled, and often blackened at the edges; generally speaking the dead areas were remarkably small. A species of *Phyllosticta* was consistently found to be present on diseased specimens from various estates and was regularly isolated from such material. Inoculation experiments on *Grevillea* leaves in the laboratory showed that the fungus was capable of producing infection, and indicate that it may be responsible for the disease. The fact that cultures of the *Phyllosticta* do not fruit at room temperature (20° C.) but produce abundant spores at 32° C. may explain the restriction of the disease to the lowest elevations.

KOENIG (P.). **Über Tabakkrankheiten und -schädlinge.** [On Tobacco diseases and pests.]—*Angew. Bot.*, xix, 5, pp. 530–541, 1937.

In this paper (read at a meeting of the Association of Applied Botany at Darmstadt) a concise account is given of the history of tobacco wildfire (*Pseudomonas tabaci*) [*Bacterium tabaci*] and of the investigations proceeding on its control in Germany, especially by the development of resistant varieties. In connexion with some general observations on the virus diseases of tobacco, mention is made of the spasmodic character of the outbreaks of such disorders. During the period from 1927–34, for instance, tobacco mosaic only occurred sporadically in Germany, but in the last year or two it has again become much more widespread. Similarly, the 'mauke' [scab] disease [*R.A.M.*, xv, p. 119], which had more or less died out of recent years, has lately revived with considerable intensity. Some remarks are made on phosphorus and boron deficiency [ibid., xvi, p. 781]; the essential character of both these elements in tobacco nutrition has been convincingly demonstrated by experiments at the Tobacco Research Institute. Boron may fitly be termed a 'mineral vitamin' exerting an influence on plants comparable to that of iodine on the human constitution. It is regularly applied (in the form of borax) to the tobacco crop at the rate of 20 kg. per hect.

JOHNSON (J.). **Relation of water-soaked tissues to infection by Bacterium angulatum and Bact. tabacum and other organisms.**—*J. agric. Res.*, lv, 8, pp. 599–618, 14 figs., 1937.

A full account is given of the author's studies on the relationship of water-soaking of plant tissues, induced by the application of high water pressure to the roots, to infection with *Bacterium angulatum* and *Bact. tabacum*, and with certain other saprophytic and parasitic organisms, a reference to which has already been noticed from another source [*R.A.M.*, xvi, p. 68]. The results showed that the condition studied, if of sufficient duration, may render a plant, normally completely immune from attack by a given micro-organism, highly susceptible, as exemplified by the fact that extensive necrosis was secured by spraying

suspensions of *Bact. angulatum* and *Bact. tabacum* on water-soaked plants of such species as tomato, lucerne, bean (*Phaseolus vulgaris*), hemp, rose, apple, locust (*Robinia pseud-acacia*), flax, marigold (*Tagetes patula*), and poinsettia (*Euphorbia pulcherrima*), which normally are not attacked by these organisms. Other plant species, however, remained immune even in the water-soaked condition. Inoculation of water-soaked tomato plants with *Bact. phaseoli* [ibid., xvi, p. 590], which normally is not capable of affecting this host, caused necrosis, and a small amount of necrotic action was also secured on water-soaked tomato sprayed with such saprophytic species as *Bacillus* [*Bact.*] *coli*. There was no evidence of mechanical injury to the tissues by water-soaking, and this indicates that *Bact. angulatum* and *Bact. tabacum* enter the tobacco plant through the stomata, and not necessarily through cuticular or epidermal wounds, as was previously supposed.

Generally speaking, the results of this work, taken in conjunction with those obtained by Clayton's external method of water-soaking [ibid., xv, p. 537], may have a wide application in furthering the present understanding of infection and progress of disease in plants. They may also have a practical bearing on the present views in regard to the overwintering of certain plant parasites in species that are normally immune from them, and may thus modify the theories underlying the prophylactic and eradicative control measures now in use.

STANLEY (W. M.). **Chemical studies on the virus of Tobacco mosaic. X. The activity and yield of virus protein from plants diseased for different periods of time.**—*J. biol. Chem.*, cxxi, 1, pp. 205–217, 1937.

Continuing his chemical studies on the tobacco mosaic virus [*R.A.M.*, xvi, p. 499], the writer determined the increase of its protein in Turkish tobacco by means of isolations from plants diseased for varying periods up to 13 weeks. The efficiency of the isolation technique was determined by isolating virus protein from artificially prepared mixtures containing known amounts of the substance. It was found that some 40 per cent. of the virus protein can be isolated from plants containing only about 1 part of this substance per 100,000 of plant material. Virus protein in Turkish tobacco plants was found to increase from an estimated 10^{-6} to 3 mg. per gm. of plant material in the course of five weeks. Virus protein in inoculated leaves was reckoned to increase over a million times during a four-day period, judging by the average number of lesions per leaf of Early Golden Cluster bean (*Phaseolus vulgaris*) developing as a result of infection at stated intervals. Although the virus protein content was found to reach a maximum five weeks after inoculation, the rate of increase reached a climax during the first three. The total nitrogen content of diseased plant extracts remained approximately uniform throughout an eight-week period, whereas the protein nitrogen increased to a maximum and then declined. The amount of low molecular weight protein decreased parallel with the rise in virus protein. No significant difference was detected in the virus activity of protein obtained from plants infected for periods of 2 to 13 weeks, whereas those infected for one week only yielded protein of appreciably slighter virulence.

WYCKOFF (R. W. G.). **Molecular sedimentation constants of Tobacco mosaic virus proteins extracted from plants at intervals after inoculation.**—*J. biol. Chem.*, cxxi, 1, pp. 219–224, 1 pl., 1937.

Analytical ultracentrifugal studies, using an improved model of the air-driven machine recently described [*R.A.M.*, xvi, p. 712], were made of the sedimentation rates of virus proteins isolated from a series of Turkish tobacco plants harvested at varying periods up to 13 weeks after inoculation with the ordinary tobacco mosaic virus [see preceding abstract]. The protein samples were prepared by two methods, half by quantity ultracentrifugation and half by a chemical technique entailing ammonium sulphate precipitations, the solvent in both cases being 0·1 M phosphate buffer of $P_H 7$. The virus proteins extracted from plants within four weeks of inoculation and purified by quantity ultracentrifugation consist of a single molecular species with $s^{20^0} = 174 \times 10^{-13}$ cm. sec. $^{-1}$ dynes $^{-1}$. A second molecular component with $s^{20^0} = 200 \times 10^{-13}$ exists in the two- and three-week samples made with ammonium sulphate and develops after a few days in the corresponding ultracentrifuged proteins; it is present in the proteins from plants that have carried the disease for more than four weeks. The very young one-week protein differs from those longer in the plant in its failure to produce the heavy molecular component even in response to ammonium sulphate treatment.

Tobacco mosaic virus proteins isolated by ultracentrifugation from plants 2 and 13 weeks after inoculation are single-boundaried if distilled water is used instead of phosphate buffer as a solvent. The virus protein in the plants themselves thus consists of only one molecular species, changing with the lapse of time after inoculation and becoming increasingly accessible to the influence of salts. Proteins isolated and purified by differential ultracentrifugation or two cautious crystallizations with ammonium sulphate show a high degree of molecular homogeneity; when water is used instead of phosphate as a solvent, the ultracentrifuged proteins are unusually homogeneous. The sharply sedimenting boundaries of such proteins contrast with the diffuse boundaries and greater mean sedimentation constants given by samples subjected to more rigorous chemical treatment.

LORING (H. S.) & WYCKOFF (R. W. G.). **The ultracentrifugal isolation of latent mosaic virus protein.**—*J. biol. Chem.*, cxxi, 1, pp. 225–230, 1 pl., 1937.

The application of the quantity and analytical ultracentrifuges [see preceding abstract] to the purification and characterization of the virus protein associated with latent mosaic of potato (ring spot strain) [*R.A.M.*, xvi, p. 702] in Turkish tobacco and *Nicotiana glutinosa* plants is described. The results of chemical analyses of the supernatant liquids following ultracentrifugation and ultracentrifugal analyses of purified preparations show that a homogeneous high molecular weight protein is obtained after three ultracentrifugations. Preparations made by the method therein outlined show a principal boundary with $s^{20^0} = 113 \times 10^{-13}$ cm. sec. $^{-1}$ dynes $^{-1}$ and usually a second faint boundary with $s^{20^0} = 131 \times 10^{-13}$. The protein is present to the extent of about 0·02 to 0·1 mg. per c.c. of the juice of infected plants, reaching a somewhat

higher concentration in *N. glutinosa* than in tobacco. The latent mosaic virus protein was found to be between 1,000 and 10,000 times more infectious than the original juice.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. NachrBl. dtsch. PflSchDienst*, ix, 7, pp. 146–147, 153–156, 1937.

GERMANY. An Order of 6th September, 1937, in pursuance of the policy of gradual elimination of potato varieties resistant to wart [*Synchytrium endobioticum*] [cf. *R.A.M.*, xiv, pp. 400, 736, and above, p. 197] enacts that as from 1938 only such quantities of selected material of the following (to be determined in each case by the administration of the Reich Farmers' Leader) as are required for export will be admitted to cultivation: Allerfrüheste Gelbe, Frühe Rosen, Zwickauer frühe Gelbe, Centifolia, Industrie, and Prof. Wohltmann. In 1938 only 600 hect. may be planted with Erstling [Duke of York] and in 1939 (for the last time) 400.

Memorandum on the legislative position in regard to plant imports into Kenya as at 31st October, 1937.—3 pp., 1937. [Mimeographed.]

By an Order (Government Notice No. 668 of 1937) dated 2nd September, 1937, made under the Plant Protection Ordinance, 1937 [*R.A.M.*, x, p. 208], the following provisions are made for the regulation of plant imports. Permits for the importation of seeds (as opposed to other plant parts) are not ordinarily required, but exceptions to this rule are constituted by coffee (other than roasted beans), cotton, tobacco, tea, cacao, coco-nuts, groundnuts, lucerne and clover, rubber, maize, wheat, clover, and peach. The importation of all kinds of fruit trees or fruit grown in or consigned from Japan, China, Korea, or Manchuria [Manchukuo] is prohibited. No plants or parts of any plant of the order Gramineae (except seeds) intended for use as fodder may be imported into the Colony. The usual arrangements for the official inspection, disinfection, and (if necessary) destruction of suspected plant imports are operative.

Government Notice No. 356 of 1937 prohibits the importation of any rooting medium for plants consisting wholly or in part of soil, whether or not it is attached to a plant.

Black stem rust quarantine. Quarantine No. 38.—4 pp., U.S. Dep. Agric. B.E.P.Q., 1937.

Under the terms of an amendment to quarantine No. 38, relating to black stem rust of cereals (*Puccinia graminis*) effective as from 1st September, 1937, Missouri, Pennsylvania, Virginia, and West Virginia are added to the list of protected States, into and between which only the Japanese barberry (*Berberis thunbergii*) and its rust-immune varieties [*R.A.M.*, xvii, p. 102] may be moved without special permit [ibid., xiv, p. 672].

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, xi, 10, p. 224, 1937.

FRENCH WEST AFRICA (SUDAN). A Decree of the Governor-General of 7th July, 1937, enforces the declaration of 'rosette' disease of groundnuts [cf. *R.A.M.*, xvi, p. 784].